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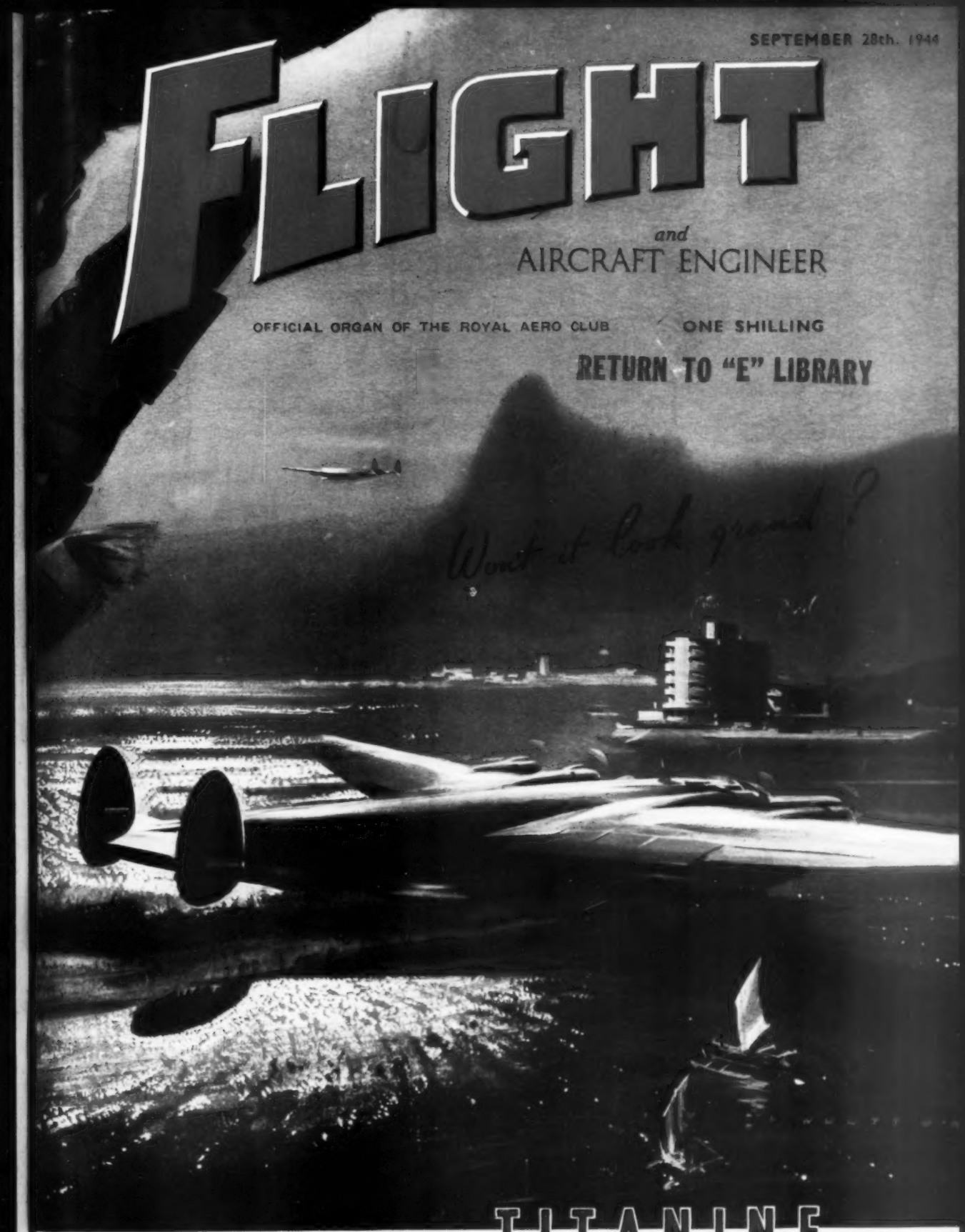

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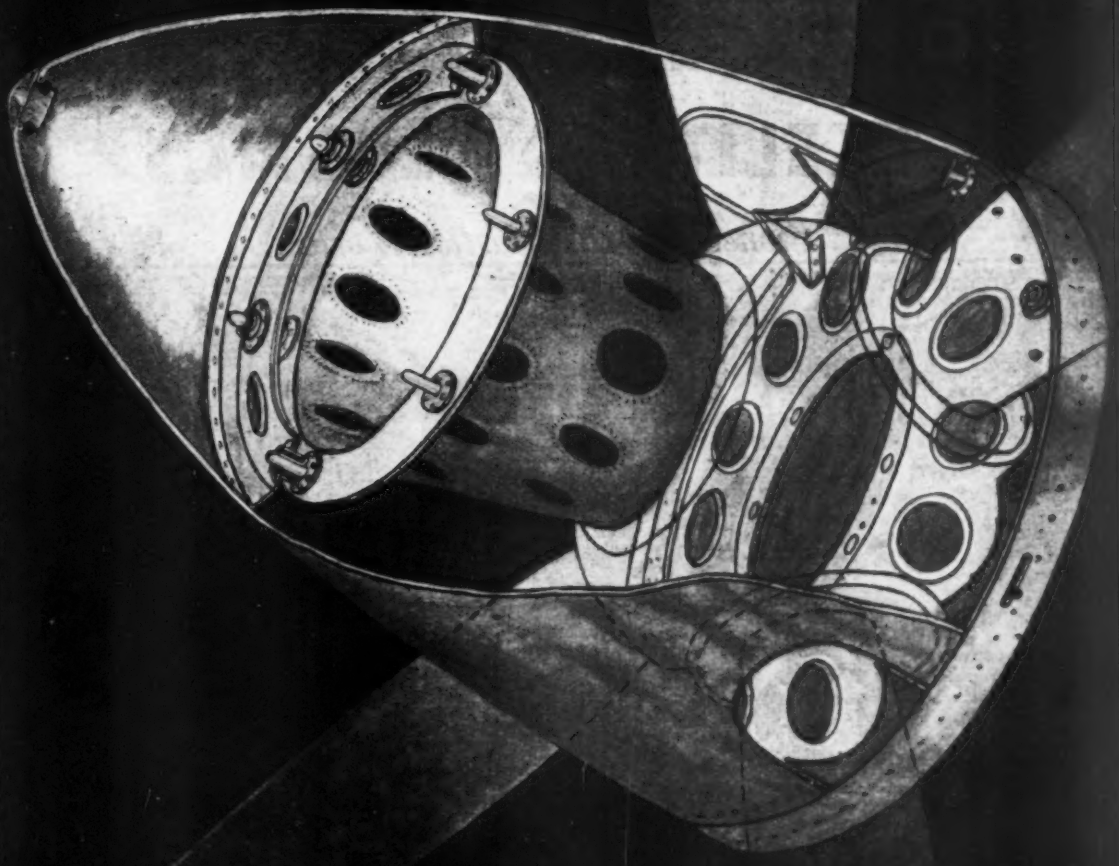

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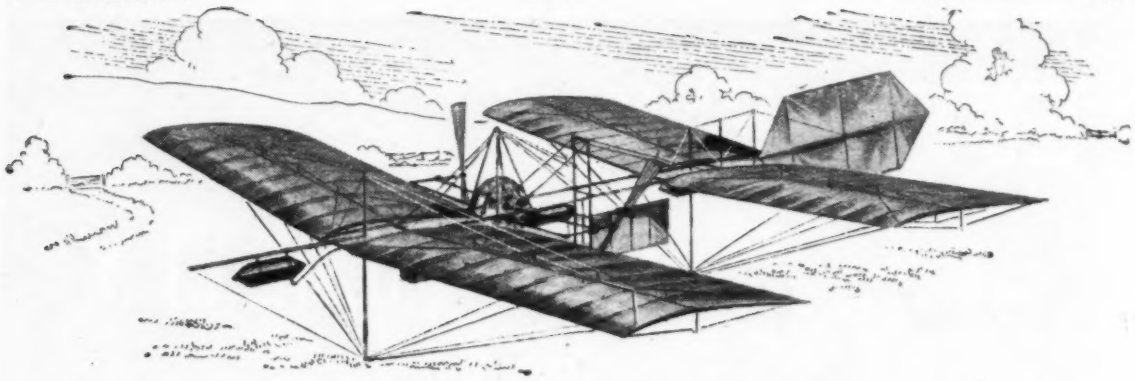

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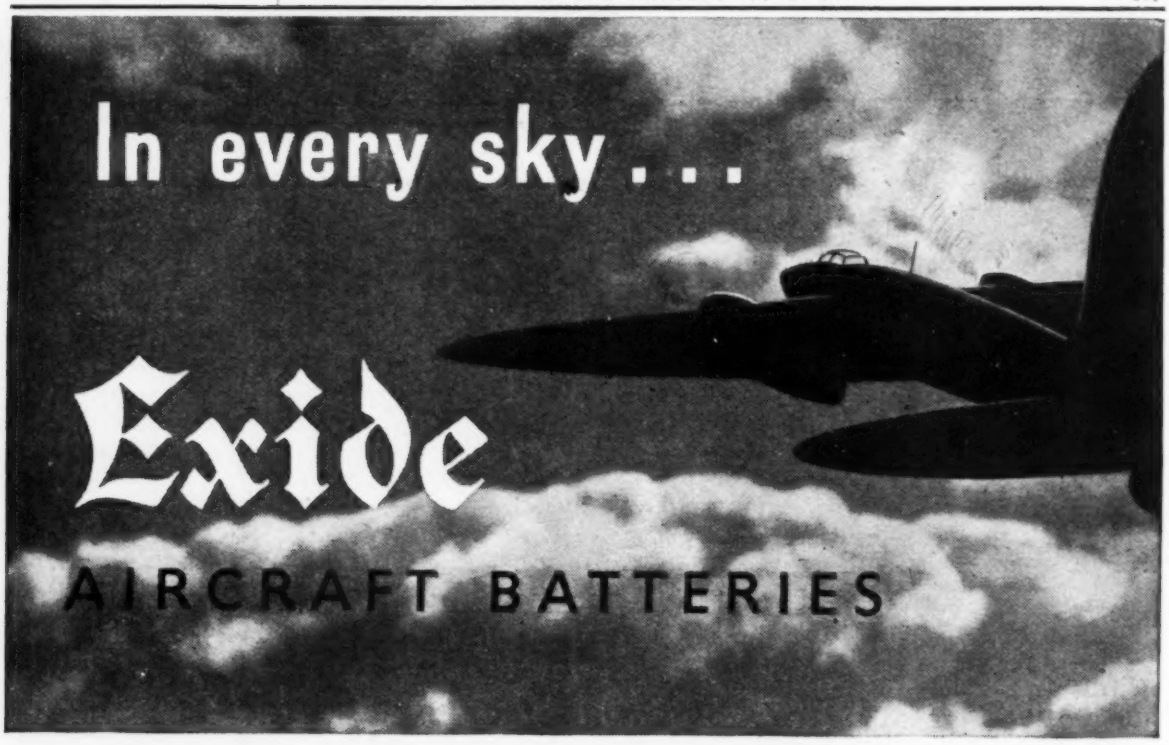

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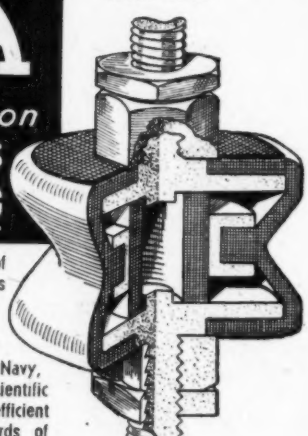

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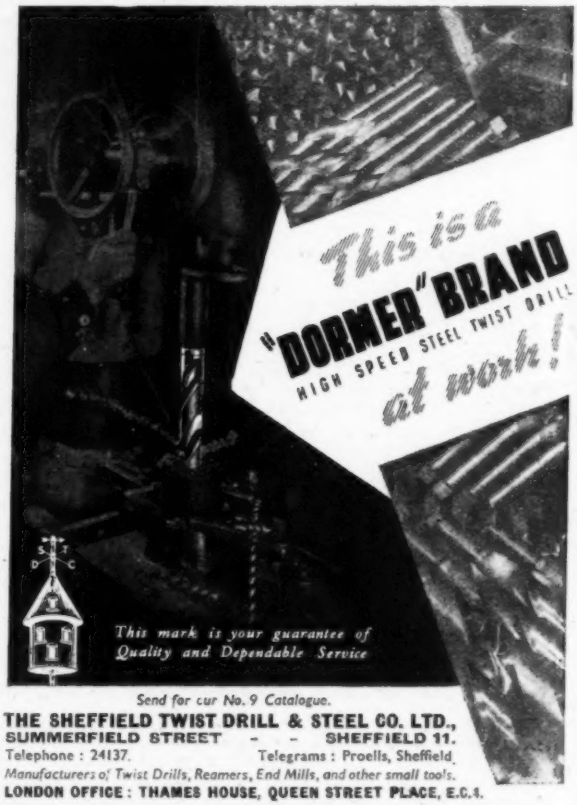
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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Managing Editor
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JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1866. Vol. XLVI. September 28th, 1944 Thursdays. One Shilling

The Outlook

"The Time Has Come . . . ."

MANY are the sections of the community that are becoming sincerely alarmed at the persistent silence of the Government on the subject of a British post-war commercial aviation policy. There are many who think that the Government has no such policy. That, it appears to us, is scarcely credible. But certainly no plain statement has ever been made by any spokesman having high authority. It is true that in his speech to the A.T.A. the other day, which we reported last week, Captain Balfour said "Plans and programmes *do* exist for an orderly world system of civil aviation, rather than uncontrolled international competitive chaos. Plans *do* exist for spreading British civil aircraft over our Empire routes. On these let the Government be judged during the coming months." That is all very well. But the existence of such plans in Whitehall does not carry us much farther unless the manufacturers, the potential operators and those who will have to build up all the ancillary services are informed. So far we have seen no evidence that they *have* been informed. All the beautiful blueprints in Government departments will not help very much unless they are translated into action.

There is, perhaps, no necessity to announce every last little detail, but certain broad guiding principles should be stated at once. Whether, for instance, it is the intention that we should have one or more "chosen instruments." Who shall, in future, guide and control British commercial aviation. Direct subsidies or payment for services rendered. These and many other problems have to be decided upon before anyone is in a position to make a start with planning. They are the bare skeleton upon which the flesh of commercial aviation must be supported. So far the skeleton is very much in the cupboard. The Government must open the door.

America's Lead

THERE seems to be in British Government circles an inferiority complex which has a paralysing effect. It appears to be due to fear of offending our good friends and allies, the U.S.A. It seems to be held that if we venture to admit that we are making plans for the future, the Americans will resent it, and that they will think we are not putting our backs into the war effort. The announcement of Britain's demobilisation plans, made last Monday, should make it clear that we have no intention of easing up until Japan is subdued. And as for the past, facts speak for themselves. In proportion to our population we have done at least as well as any of the allied nations. No American with a knowledge of our achievements will deny that.

In this connection we may quote from an article written by Mr. Guy Vaughan, president of the Curtiss-Wright Corporation, and published in our excellent contemporary *U.S. Air Services*. Mr. Vaughan writes:

> "Twice we have been able to create air power out of the depths of unpreparedness because friendly allies, by staving off the mutual enemy, 'loaned' us the time necessary to accomplish this. While Great Britain's gallant few fought off the *Luftwaffe* in the dark days of Dunkirk, we were able to devote ourselves to making up for many years of lost time. Furthermore, America's air power revival gained at least a year of valuable time before we were drawn into the war because French and British orders made plant and production expansion possible that much earlier."

Pan American Airways have come out in the open with plans for girdling the globe. Some of the routes for which the company has applied to the Civil Aeronautics Board parallel, in part at least, British Empire routes. Senator Josiah W. Bailey, of North Carolina, has sent two Senate Bills to U.S. Secretary of State,

Cordell Hull, for comment. One deals with the setting up of an Independent Civil Aeronautics Authority and an Independent Safety Board, the other with the creation of an All-American Flag Line, Inc. In the titles of both Bills it is admitted that their purpose is to assure to the United States world leadership in air transport.

True, Pan American have not yet obtained sanction from the C.A.B., and the Bailey Bills are so far only drafts. But both are eloquent testimony to American determination to take a leading place in commercial aviation. We do not blame our American friends in the least. Good luck to them. Their drive and enterprise are entirely praiseworthy. We only wish there were more of it in Whitehall. But in all fairness America could surely not object if we too showed some determination to have that share of post-war air transport to which our achievements in the war, not to mention the dire need of rapid transport for the Empire, entitle us.

Airborne Queries

IT has been admitted by correspondents on the spot that in Sicily we made some tactical errors in the use of airborne troops—even though Sir Bernard Montgomery said that their work saved the Eighth Army a week. Such errors are excusable when experiments are being made with a novel arm in warfare. More airborne landings were made somewhere south of the Cherbourg peninsula during the conquest of northern France, but very little has been published about their results.

It was doubtless with the feeling that enough had been learnt to justify still larger operations that the First Airborne Army was formed, and that a very considerable contingent of it was dropped ahead of the Allied forces which were fighting their way towards the lower reaches of the Rhine. This confidence was doubtless justified; but it would still be rash to assume that we now know all that can be learnt about the use of airborne troops. It seems that we are still in a stage of experiment, successively undertaking larger operations, but still in the position of learning. It would, we hope, be unjust to say that our commanders are learning by a process of trial and error, for it is to be hoped that no cardinal error was made.

The whole operation might have been a failure but for Gen. Dempsey's amazing dash forward through Eindhoven to Nijmegen. The airborne men prevented the destruction of the Nijmegen bridge over the Waal, but the bridge could not be crossed until troops of the relieving force had most daringly forced a crossing of the river lower down and advanced along the northern bank to the bridge. Then came the problem of crossing the river Lek to relieve the other airborne contingent which was hard pressed round Arnhem. By the time these words are published the result will perhaps be known, but on Sunday last it was reported that the Germans were once more in a position to blow up the Arnhem bridge, but apparently did not wish to do so.

At the moment the only safe conclusion to draw is that it is premature to think that to drop an airborne body ahead of one's main forces *inevitably* means that the battle has been won.

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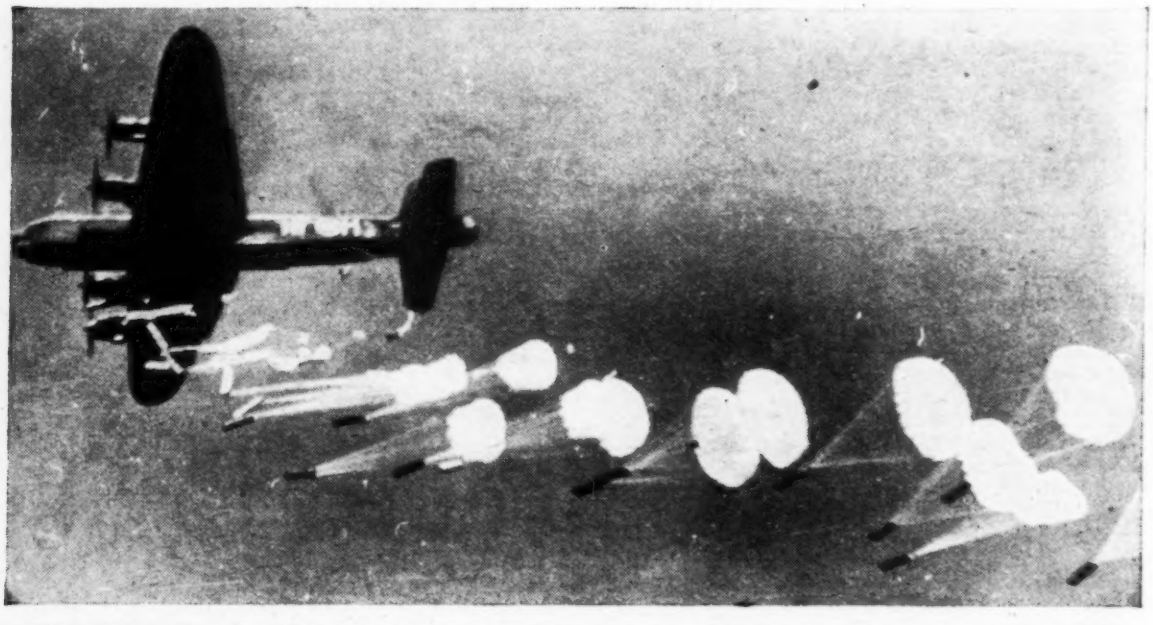
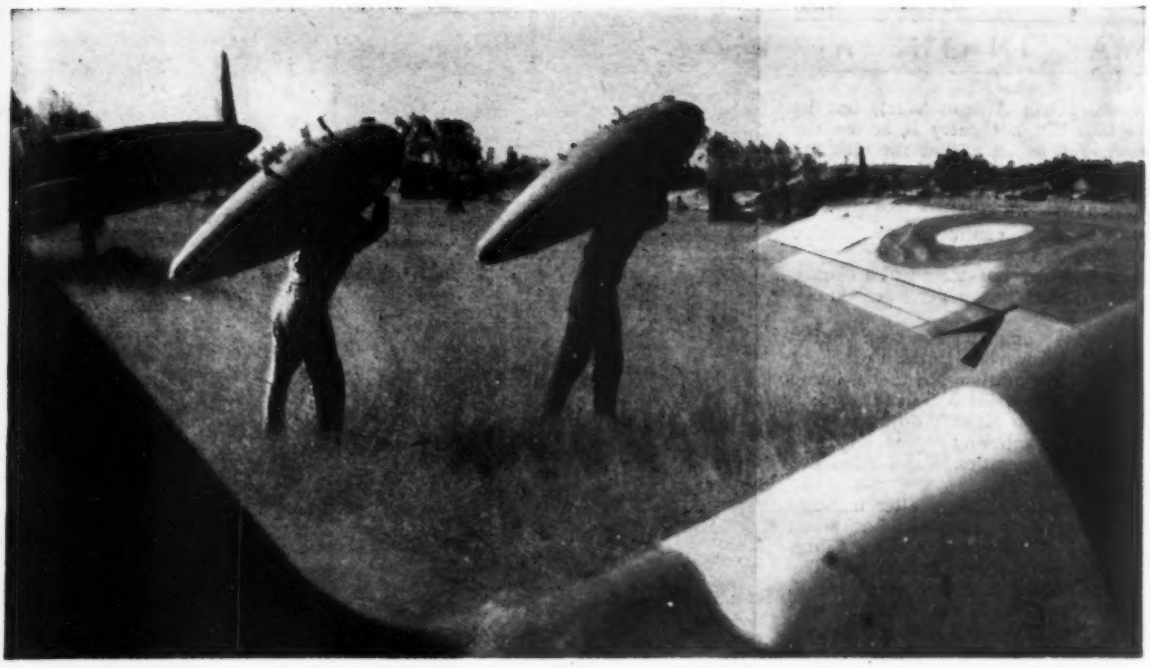


STIRLING SERVICE: In addition to their long service with Bomber Command, the Short Stirlings have done wonderful work in dropping arms to resistance movements on the Continent. They also took a prominent part in the landing and supply of airborne troops on the Orne and on the Rhine.



IN BELGIUM : Mustangs with long-range tanks operating from an airfield in the Low Countries.

WAR in the AIR

Airborne Army Progresses Well : Heavy Bombing of Channel Ports : Russian Air Mastery Near the Baltic : Carriers Attack Sumatra

ANY MORE FOR THE SKYLARK : Paratroopers boarding a Dakota for the big show in Holland.

THE great invasion of Holland by forces of the 1st Allied Airborne Army appears to be something in the nature of a copy book success and may, no doubt, itself be the subject of military exercise books of the future. None the less, there is doubtless still something to learn about the use of airborne troops. Airborne forces were being landed on subsequent days, among the areas to receive them being Utrecht and Arnhem. The latter is about ten miles north of Nijmegen and on the northern bank of the Rhine. Gen. Dempsey's 2nd Army made a lightning advance from Eindhoven and connected with the airborne men at Nijmegen. This epic thrust had the effect of shearing in two the main enemy forces in southern Holland and so preventing the force making an orderly withdrawal to the natural defence line of the broad Rhine. This appears to be the most likely barrier which the Germans will man as a bulwark, and the recent comments of the German news service regarding the obsolescence of concrete defence walls added weight to this view.

There can be little doubt that the dividing of German forces in Holland, which will be made complete by penetrating a few more miles to the shores of the Zuider Zee, makes clear the way for a right hook of our ground forces over the lower Rhine and so to the excellent tank country leading direct to Berlin. A deployment of this type would reinforce the American thrust beyond Aachen and bring under immediate menace those key industrial towns of the Ruhr, without the stable foundation of which the German war potential must collapse.

The section of the Airborne Army which had the most difficult task was naturally that which landed round Arnhem, to the north of the Rhine. It is too early to dogmatise about airborne troops, but it appears that they are most useful if they can surprise important points, such as bridges, ahead of the main ground forces. Having no base, they cannot be expected to hold on indefinitely, and it is of the utmost importance that the main ground forces should lose no time in thrusting forward and linking up with them. The 2nd Army did wonders in pressing forward at record speed up to Nijmegen, and even reaching the branch of the Rhine known as the Waal (we seem to have here an echo

WAR IN THE AIR

of the South African War), but its impetus did not carry it across the river, and so for a time the airborne men dropped round Arnhem were left to their own resources, and had to fight hard to hold their ground. Of course, they continued to receive supplies and, perhaps, reinforcements from the air, but they had to make shift without heavy guns and heavy tanks.

Bomber Command has been getting on with its own job to some excellent effect. Preparation for the airborne invasion was assisted by the employment of 1,250 aircraft during twelve hours of daylight on the great day, and the whole operation was carried out without loss.

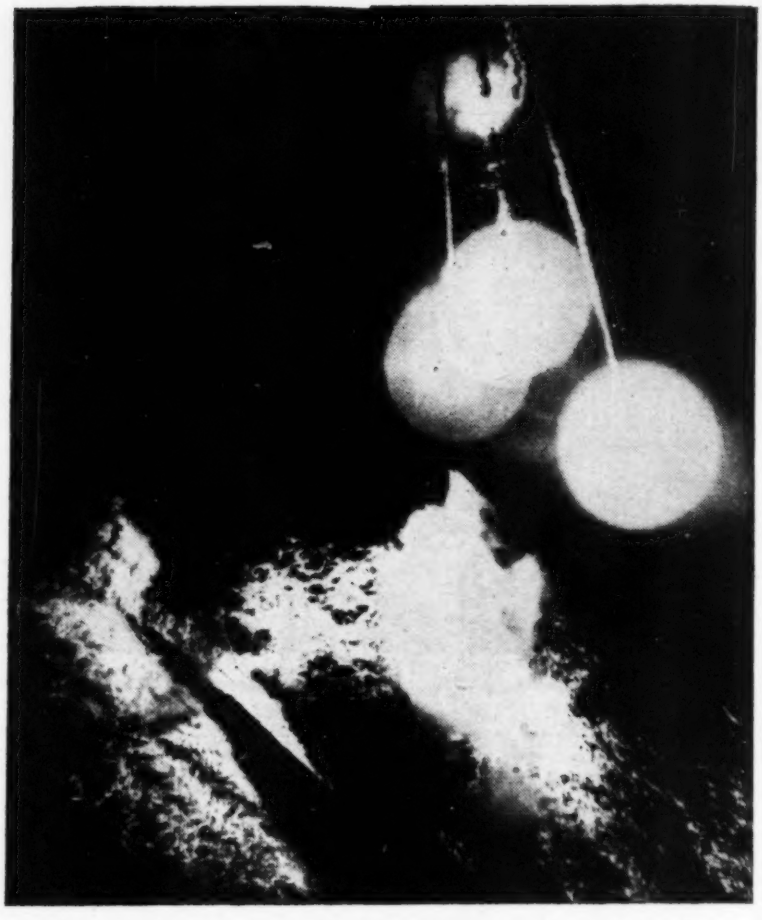
Additionally, shortly after mid-day on Friday, 15th, a force of Lancasters attacked the *Tirpitz* in Kaa Fjord, Norway, with 12,000 lb. bombs. The first machines to bomb were able to see the target quite well, but following crews had their view obscured by the elaborate defensive smoke screen so that all they could discern of the much harassed German battleship was her superstructure. Nevertheless, the attacks were pressed home and a sudden vivid red glow was seen, too large, in the opinion of the pilot who described it, to be the explosion of even a 12,000-pounder. Not the least remarkable aspect of this operation is that the Lancasters flew their 1,500-mile trip without fighter cover and without loss.

Lancasters again attacked Bremerhaven, but this time with the huge number of 420,000 incendiary bombs, the whole of which were dropped in 20 minutes. They left the port well alight from end to end with the fires apparently out of control.

Various Activities

THE valiant defenders of Warsaw were sent succour in the shape of badly needed arms, ammunition, medical supplies and food, by a shuttle flight of Fortresses which flew from England, dropped the supplies by parachute, and continued on to American bases in Russia. The supply aircraft were covered by protecting Mustangs, some of which accompanied them the whole way. Those which turned back at the Polish border encountered some enemy fighters on the return trip and shot down four of them. Not content with this, they strafed airfields in Germany and destroyed three more aircraft on the ground, returning themselves without loss.

While the voyage of the 1st Airborne Army to Holland was marvellously successful, it would be a mistake to imagine that there were no unfortunate incidents. Things will not go entirely right, even in the best-managed organisation, and on the first day of the movement the Air/Sea Rescue Service picked up about 100 men. The service had its high-speed boats out in great numbers all along the route which the gliders and their tugs were to follow, and so smart were the crews about their job that many of the rescued men did not even get wet. It was, in fact, the great day for the Air/Sea Rescue people, and they showed up in grand style. Probably the boat crews, however, would say that it was an easy day compared with some others on which boats have had to search for hours before finding the dinghy of a ditched bomber.

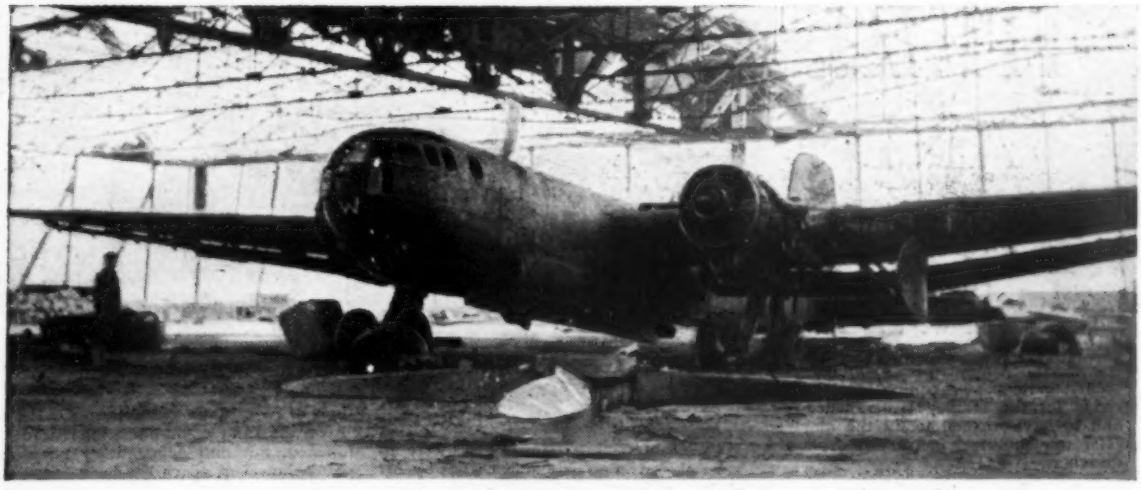


NIGHT ATTACK : A U-boat lit up by the flares dropped by a Sunderland of Coastal Command on patrol. Depth charges finished off the job.

Veterans of the last war will remember the occasional anxiety felt in Britain about the safety of the Channel ports; and, in particular, the risk that they would fall into German hands after the Second Battle of Ypres in April, 1915, when the first use of asphyxiating gas by the Germans made a breach in the Anglo-French line, which could hardly have been made good if the enemy had had reserves in readiness to exploit the advantage.

Now, for four years, the Channel ports have been in German hands. This did not have all the disastrous results which in 1915 seemed inevitable if such a thing had happened then; but it certainly placed a terrific strain on the British Navy and Air Force, and made the air attacks on Britain much more hard to bear than they would otherwise have been.

These ports have lately been falling, one after another, to the Anglo-American Army, which has been assisted by bombardments from the guns of ships and terrific blows by Allied heavy and medium aircraft. Le Havre, Brest and Boulogne were the first to fall. Calais last week was heavily bombed for 2½ hours, during which between 3,000 and 4,000 tons of bombs were dropped. Calais has always been a difficult place to take, and Rodin's group of statuary in the gardens beside the Palace of Westminster recalls that Edward III, who had neither heavy guns nor aircraft at his disposal, could do nothing but starve the place out. Then, for some centuries, the French were unable to dislodge the English. Even the all-conquering Germans (as they seemed in 1940) found it no easy matter to



LUFTWAFFE LEAVINGS : A Heinkel 177 left nearly intact by the Germans in a hangar at Chateaudun. It appears to have Junkers-type auxiliary aerofoils.

WAR IN THE AIR

capture the place from three battalions of British Rifles. Now once more the British have been besieging Calais, but as friends, not enemies, of the French. The wheel of history turns often in a very strange way.

Russian Air Energy

COMPLAINT has been made time and again in these columns that too little has been heard of the doings of the Russian Air Force. Now that the *Luftwaffe* is, so to speak, on its last legs, Russian aircraft have been playing a much more conspicuous part than before in helping the advance of the Red armies. Red fighters have considerably reduced the German bombing of the Polish patriots in Warsaw, and after British and American machines had set the example of dropping arms and food to the Poles in the city, Russian aircraft have followed suit.

A despatch from the northern end of the Eastern front has described how the Russians made good use of their air mastery to help their advance in Estonia and Latvia, where they split the German forces in two. In that region, as in so many others, Hitler made the cardinal error of holding on too long, when sound strategy demanded a timely withdrawal. To fight to a finish, on the lines of the Spartans at Thermopylæ, is proof of bravery and devotion, but it does not win battles or wars.

Down in the south, the Russian Air Force has also been raiding Budapest and other places in Hungary. In this attack the 15th Air Force from the Mediterranean has enthusiastically joined in, but its attentions have been directed chiefly to railways, oil stores, and similar targets. The 15th Air Force is well trained in strategic bombing, and it is not to be supposed that the crews of Russian bombers are equally expert at the art. To the Russian commanders the Air Force is a Tactical Air Force and no more. In consequence it may be concluded that the people of Budapest had a very unhappy time when the Russian bombers were overhead, a time comparable to that suffered by Londoners when the German bombers (also inexpert at selective bombing by night) dropped their bombs broadcast over Greater London with no more definite idea than to kill civilians and destroy property which was of no military importance.

We have no desire to be unjust to the Russian aircrews; but we have learnt in Britain that strategic bombing is a highly specialised art, requiring much study and much practice. The Hungarians, however, have won a reputation second only to that of the Germans for brutality to the people of lands which they have occupied, and this is certainly the moment in which to let the last ally of Germany feel the weight of the Allied arm. They have been feeling it.

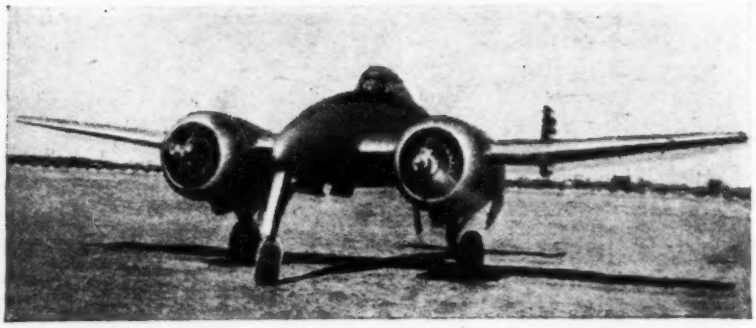
Carrier aircraft have again been prominent in the Pacific. The Eastern Fleet recently sent carriers with an escort to Sumatra, and the aircraft attacked the railway repair centre at Sigli, the most important place of the sort in the island. Opposition was almost nil.

The Japanese have lost all their enterprise in the air, according to Mr. A. L. Gates, Assistant Secretary of the U.S. Navy for Air. He was on a carrier during the recent attacks on the Philippines, and only on one morning did they see signs of Japanese aggression, when 10 torpedo-aircraft flew out against the fleet. Two were shot down by A.A. Mr. Gates said, "It must be lack of good pilots or lack of air thinking."

It is reported that by now only one Walrus remains shipborne in the fleet. It is used by the medical officer of the escort carrier H.M.S. *Emperor*.

GERMANY'S SIDE ENTRANCE : One of the bridges across the river Lek, a secondary branch of the lower Rhine, at Arnhem. It was to seize the bridges on the Rhine delta that the big airborne forces were landed last week.

HERE AND THERE



STILL EXPERIMENTAL: The XP-50 twin-engined Grumman fighter has been developed from the "Skyrocket" which never got beyond the experimental stage.

Fast Worker

HENRY KAISER, the famous high-speed American shipbuilder, is reported to have acquired the patent rights for the Stanley Hiller helicopter, and to have learned to fly the machine after five minutes' instruction from the designer.

Portuguese Plans

A SPECIAL Department of Civil Aviation has been created in Portugal under the control of Dr. Salazar, the Prime Minister, says a Lisbon report.

The new department will concern itself with all matters affecting civil aviation except within the Portuguese colonies.

From Cockpit to Desk

OFFICERS of the administrative and special duties branch of the R.A.F. —the business side of the Service—are now being replaced by general duties officers who were formerly on operations.

Officers thus displaced will be considered for other employment.

Indian Aviation

TATA AIRLINES, India, had flown approximately 8,950,000 miles, with a total of 16,420,000 passenger-miles since it began operations in 1932.

At present it employs 15 pilots, 13 of whom are Indians and two natives of Ceylon. Their 15 radio officers are all Indians.

Anglo-American News

TWO interesting items of news were included in an article last week by Air Comdre. Howard Williams, air correspondent of *The Daily Telegraph*.

They are that Lockheed has an airliner project for 1945 to be known as the "Lockheed Constitution," and that Rolls-Royce Griffon engines are now also being manufactured in the U.S. in addition to the Merlin.

From Down Under

THE following greeting has been received by *Flight* from Mr. Hudson Fysh, Qantas Empire Airways:—

"We are sending you greetings from Australia on the auspicious occasion of the reintroduction of civilian All-the-Way Air Mail between Australia and England and flying all-British.

"The old Empire Air Mail Route was broken on February 2nd, 1942, following the shooting down of the Empire flying boat *Corio* near Koepang, Dutch Timor, by six Zero fighters and when the first great Japanese onslaught threw them across the Netherlands East Indies.

"On July 10th, 1943, the Indian Ocean was first bridged by a regular air hop of over 3,500 miles from Ceylon to Australia, and communications were re-opened, but only for military purposes. Now, however, space has been found for a limited public air mail carriage.

"The East-bound opening of this service was marked by 'Air Letters' postmarked London, August 24th, which arrived in Sydney on September 4th, and now the West-bound opening is marked by the service carrying this 'Air Letter.'

"The reintroduction of this civilian 'Air Letter' service, small event though it may seem, does mark an important step, as pointing to better and happier days, after five years of war in which you people in England have particularly lived as front-liners, and in faith in a future which is now dawning."

All the Latest!

LONDON'S morning newspapers were delivered in Cairo the same evening last week. They were taken by the first Dakota of R.A.F. Transport Command to carry passengers and freight from Britain to the Mediterranean across France, covering the 2,650 miles in 14 hr. flying time.

Passengers and crew breakfasted at Naples after an early morning start and

SCARS OF LIBERATION: Those who knew Le Bourget Airport, on the outskirts of Paris, before the war, will still be able to recognise its control tower and imposing administrative buildings in spite of the battle scars suffered in the cause of liberation. The remains of a concrete defence post, built by the Nazis is seen in front of the control tower.

HERE AND THERE

arrived in Cairo at teatime. There is, of course, nothing very wonderful about this, but it conjures up visions of the post-war holiday possibilities using airliners capable of a 250 m.p.h. average—a long week-end in Cairo would be a pleasant little break now and then!

November Conference

MORE than 50 countries, it is reported, have been invited by the U.S. Government to attend an international conference on civil aviation in America, beginning on November 1st. They include the United Nations and their associated nations, European and Asiatic neutrals, and all the Latin-American countries except Argentina.

More Scholarships

TWO more scholarships designed to help promising aircraft apprentices to get a technical training they could not otherwise afford have recently been announced.

One has been given by Lady Norman and three friends in memory of the late Air Comdre. Sir Nigel Norman, and the other by Sir Geoffrey de Havilland in memory of his test-pilot son John.

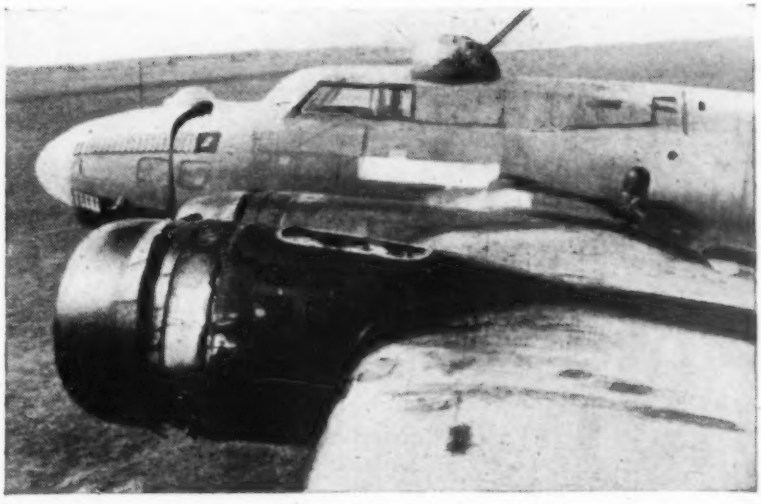
Sir Nigel, who received the C.B.E. for the part he played in the development of our airborne forces, was killed on active service in May, 1943; and John de Havilland met his death when the Mosquito he was flying collided with another one in August of last year.

Both scholarships are being administered by the S.B.A.C.

B.O.A.C. Chief Resigns

MR. A. F. BURKE, one of the three assistant directors general of British Overseas Airways Corporation, has resigned to take up an important post on the technical side of civil aviation.

Mr. Burke began his aviation career among airships and played a part in the building of the R100 which crossed the Atlantic in 1930. He joined Imperial Airways in 1935 and took a particular interest in the development of the Empire Airmail scheme. After a period with M.A.P. he joined B.O.A.C. early this year.



A WING AND A PROP: Hit by enemy *flak*, one of this B-17's engines burst into flames and its airscrew flew off. To the amazement of the crew, the airscrew came to rest on the wing and remained there for the rest of the 600-mile flight back to its base in Britain.

B.O.A.C. Party

MEMBERS of the B.O.A.C. staff in this country with 20 or more years' service with the corporation and its predecessors, were recently entertained by the chairman and other members of the corporation at a party at the Dorchester Hotel, Park Lane.

The guests totalled 67 members, and Lord Knollys sent a cable on their behalf to the staff overseas, telling them of the function.

Roots of U.S. Expansions

FOR the guidance of any who may be under the mistaken impression that Britain was content to rely almost entirely on Lend-Lease supplies and equipment from overseas, Mr. E. J. Stettinius, the U.S. Assistant Secretary of State, who recently succeeded Mr. Sumner Welles, pointed out that it was British orders for aircraft and other munitions, paid for in cash before Lend-Lease began, which enabled some of the most important American factories to expand their plant and organise their production so that, when the U.S. did come to war, the foundation for a greatly increased output was already laid.

Big Business

MR. DONALD W. DOUGLAS, president of the Douglas Aircraft Corporation, has announced that three of the world's largest airlines have signed contracts with his company for 93 high-speed four-engined airliners valued at more than $50,000,000 (about £12,500,000).

The contracts have been placed by American Airlines for 55 aircraft, by United Airlines for 35, and by Pan American-Grace Lines for three. Mr. Douglas stated that negotiations were proceeding for additional contracts with Eastern Airlines and United Airlines.

He added: "Signing of these contracts definitely assures post-war leadership for the U.S. in world air transport."

New Pan American Routes

PAN AMERICAN AIRWAYS, it is reported, has filed applications with C.A.B. for two new trans-ocean services, and the extension of its pre-war routes.

One of the new routes is New York-Moscow via Newfoundland or Labrador, Iceland, Oslo, Stockholm and Leningrad, and is 6,408 miles in length. The other proposed service is Seattle-Canton via Nome (Alaska), Kurile Islands, Tokyo and Shanghai, a distance of 6,830 miles. This second service would link up with another operating through Hanoi (French Indo-China) to Calcutta.

"Four-engined planes of advanced types" are said to be earmarked for these new services, but no further disclosure about them is made.

Among the extensions sought by Pan American is the stretching of its pre-war Lisbon-London line to Paris, Berlin, Geneva and Moscow.

D

ROCKET RETRIBUTION: The wreckage of a train-load of 120 "doodle bugs" caught by a rocket-firing-Typhoon pilot on its way to a launching site.

AIRBO
OPERAT

An Account of the light Stirling in the La ding Rhine at Arnhem by th Airborne Army

Short Stirling IVs marshalled on the perimeter track ready to start duty as tugs.

By JOHN YOXALL
(Our S.H.A.E.F. Accredited War Correspondent)

"Wot makes the soldiers 'eart to penk, wot makes 'im to perspire?
It isn't standin' up to charge nor lyin' down to fire;
But it's the everlasting waiting. . . . . ."
—Rudyard Kipling.

KIPLING knew his soldier and the things that try the soldier most. In these days of different weapons and different speeds it is just as true of the human element.

This airborne operation had been on and off so many times that it threatened to become legendary.

Several times I had been despatched post-haste to the airfield from which I was to fly, but on each occasion the show was postponed and finally cancelled. Once I went to bed at 9 a.m. after putting in a call for 1.30 a.m. When I was roused I started to dress in a state of bemused panic. The batman tapped me gently on the shoulder and said, "No sir, I'm telling you that its postponed again for 24 hours."

During the waiting down in the Mess other operations were talked over. The pilot of *E-for-Easy*, who was to fly just ahead of us, had been shot down over Normandy when he was on tug duty taking in the 6th Airborne Division on D-Day. He was a prisoner in German hands for a short while when, to his surprise, the German captain in charge of his captors handed him his rifle and became a voluntary prisoner with all his 65 men. He marched them into our lines saying, "Look what I've found." He was back with his squadron in a few days.

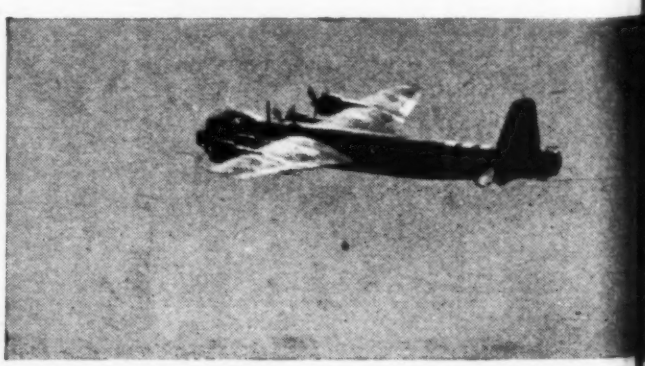
The dropping zones in Holland. Much of the north and north-west area of the country has been flooded. (Right): Stirling tug *N-for-Nuts*, with its glider in tow, flies on our starboard beam over the North Sea.

Transport by Air

The Stirling *C-for-Charm*, which was to take me, had dropped paratroops on D-Day from only 500ft. While they were approaching the D.Z. the rear gunner—the best shot in the Group—got off 2,000 rounds at A.A. gun emplacements without a stoppage of any sort. Glider-towing and paratroop-dropping is, however, but a sideline for these crews. Their everyday—or, rather everynight—job was to supply the Maquis and other underground patriots with arms, ammunition and supplies. Even jeeps have been dropped with a parachute at each corner.

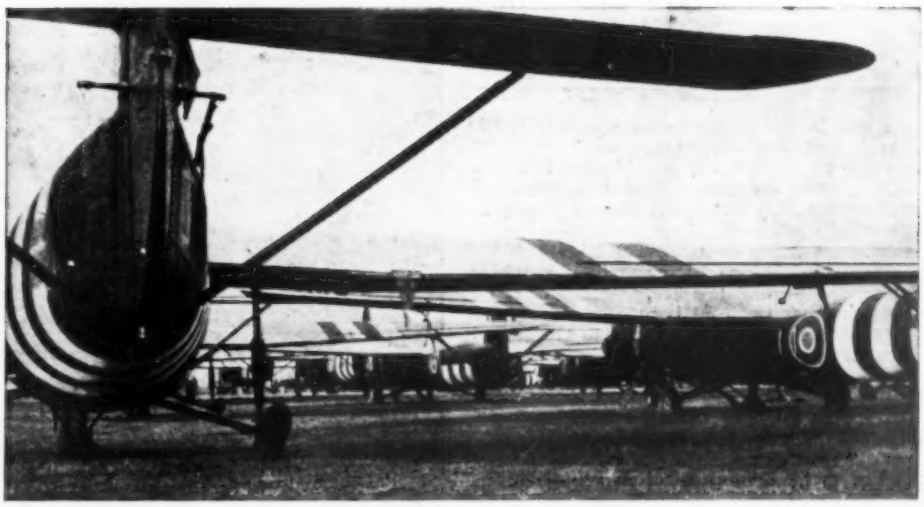
The navigator "earns" his living at this job of supply-dropping. On one trip *C-for-Charm* had a dropping height of 5,000ft.—the D.Z. was 4,000ft. above sea level. The area was surrounded by mountains 9,000ft. high with clouds down below the summits. The quality of the R.A.F. aircrews has to be extremely high to do this type of work at all.

Lt. Gen. Brereton to his men just before they took off:
"You are taking part in one of the greatest airborne operations in military history. On the success of your mission to-day—on the navigation and flying skill and courage of the aircrews and the skill and courage and speed of the landing force—rests the difference between a quick decision in the west and a long-drawn-battle.
"I know I can depend on all of you. God speed to you."



BORNE RATION

the flight of One Short La ding Across the hem by the 1st Allied orne Army



Airspeed Horsa gliders, ready packed with guns, and jeeps parked on the airfield.

From Air Vice-Marshal L. N. Hollinghurst, C.B., C.B.E., O.B.E., D.F.C., to R.A.F. aircrews under his command :

"You are about to take part in an airborne operation transcending in importance even the one launched on D-Day itself.

"It is an operation vital to the outcome of the land battle. The Army is relying implicitly on us to drop the men in sufficient numbers at the right place at the right time."

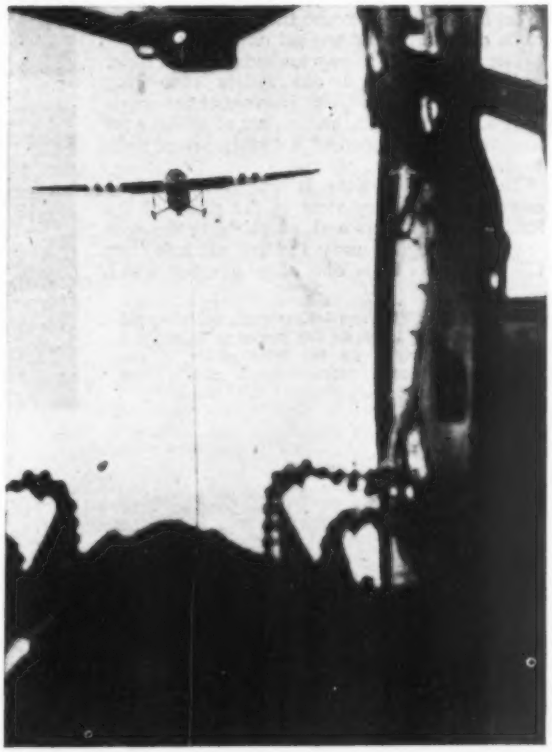
To return to the operation. At last, after an urgent call from the Air Ministry and a long drive into the country on the Saturday afternoon, it appeared as if the "Op" was really on. The camp was already "sealed" and crews briefed in preparation for the morning.

The evening was, of course, spent in camp. The army, as is their traditional wont on the night prior to going abroad, threw something of a party. The R.A.F., as is usual when going on ops, reverted mostly to soft drinks and an early bed. Myself, I took a .22in. rifle into the woods, with the padre and the rear gunner, with the idea of shooting wood pigeons. I was thankful that no pigeon came into my sights that evening. I had a horrid feeling that the next day might see me as the pigeon and the German A.A. gunners as the sportsmen.

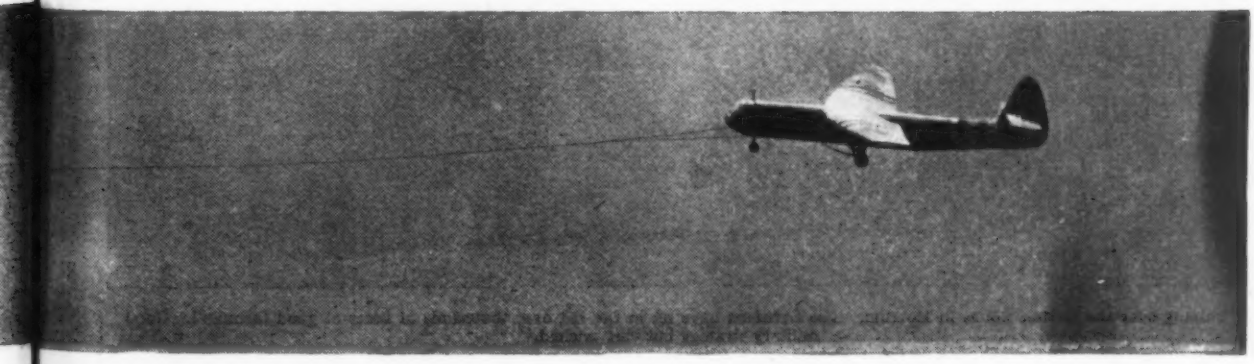
The Show is On

To bed early with a call in for 6 a.m. and a hope that no incident or change of weather would stop the show now. And so it was.

Aircrews and, for the purpose of the act, this includes glider pilots, are a law unto themselves. Here they were at 7 a.m. on the morning of the biggest air show ever put on, grumbling about trivial matters and playing as if it were mid-afternoon. An airborne captain complained that his colonel snored and woke him at



Through the rear turret. The air gunner's picture of the journey to Holland.



AIRBORNE OPERATION

4 a.m. In the games room table tennis, billiards and shove-ha'penny went on continuously. Outside the ground staff streamed to work on their bicycles. It is of interest to notice that the W.A.A.F., despite masculine dress, has lost none of its feminity—most of them were riding on nearly flat tyres.

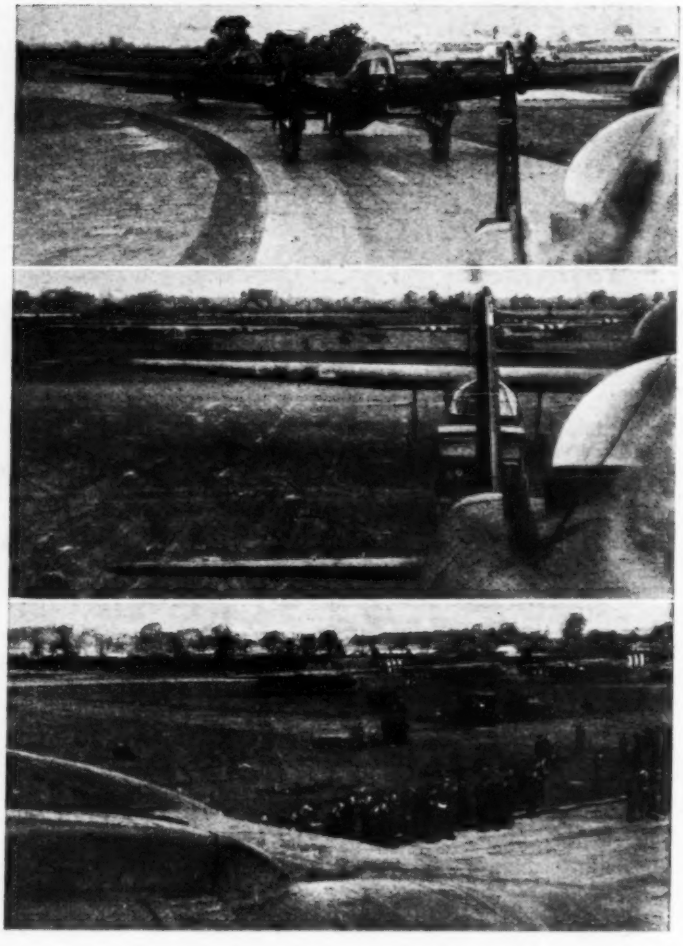
Down on the airfield marshalling is taking place, the Stirling IVs being packed close on the perimeter track on both sides, facing the main runway. The loaded gliders are parked in a rectangle at the end of the runway.

Final Preparations

Back to the crew room for final briefing—weather had caused a postponement, but only of one hour—and then to the Intelligence Officer to hand in personal papers and draw escape kit. Next to the parachute section to be measured for a "brolly" harness and Mae West flotation jacket, and then there is nothing to be done but stand around until take-off.

The minutes tick away towards take-off time, and on the airfield one senses something between an air of festival, because of the greatness of the occasion, and an air of anxiety for hundreds of good men with a stern job of work to do.

The Control Officer is up in a specially erected box in easy view of the pilots of the Stirlings and gliders and, precisely to the split second, he signals away the first aircraft from this station. It is one of a number which



Right (top) : Stirlings follow each other round the perimeter track to the runway. (Centre) : A tractor brings up the next glider to go. (Bottom) : Scene from second pilot's seat during the early stage of the take-off.

Passing over the terrible floods in Holland. The Germans have let in the sea over thousands of acres of good farmland. Good military strategy but very wicked.

AIRBORNE OPERATION

constitutes a pathfinder force carrying para-troops who prepare a rough landing ground for the gliders. In the damp air of the autumn morning a ring of condensation appears round each airscrew and, as the Stirling goes by, this appears as two undulating lines—one above the wing and one below. In quick succession the remainder of the pathfinders follow.

The whole station is now ranged alongside the perimeter track and watching the runway; down near the gliders stand the khaki-clad figures of the airborne troops with their maroon berets. Above the marshalled Stirlings, Dakotas and Horsas from another station start to form a stream which passes directly over the 'drome.

The badge of the Army of Liberation. A flaming sword surmounted by the rainbow of promise with a blue sky over all.

10.25 a.m. and our first Stirling and Horsa get away. The glider is first off the ground, in 31 seconds, and three second later the Stirling comes unstuck.

The take-off rhythm is a joy to watch. No panic. No shouting. The tug aircraft converge on the runway from the perimeter track; the tow-rope is fixed and the next glider brought up by tractor. As one Stirling clears the end of the runway another is given the signal to go. We were the last but eight of the whole operation. At long last the time came for us to get away. As the door of the aircraft is slammed shut one immediately ceases to see the operation as a whole. From now onwards vision is limited to one's own small part of the complete thing.

Into the Stream

How sluggish is the take-off. Only the rear gunner can see the Horsa with its men on board as the cause of this slowness. Up in front the Bristol Hercules engines give their maximum take-off power with the airscrews in fine pitch. Yet there seems to be an invisible giant holding us back. At last we are away and set off on the reciprocal course of the one on which we shall actually steer to Holland. The object is to enable each aircraft to get into its allotted place in the stream, making up for any earliness or lateness by lengthening or shortening the time of flight on the reciprocal course. In sight of the Bristol Channel we make a turn to starboard and come in alongside *N-for-Nuts*, who will be our companion in the stream all the way to the D.Z.

From the astro-dome the glider can be seen sailing majestically along behind. It rides high to get out of our slipstream and is a little on our starboard quarter. The tow-rope tightens and loosens a little occasionally as we get into bumpy air, but, generally speaking, the glider remains very steady with such a tremendous pull on the cable that there is but very slight indication of any catenary curve.

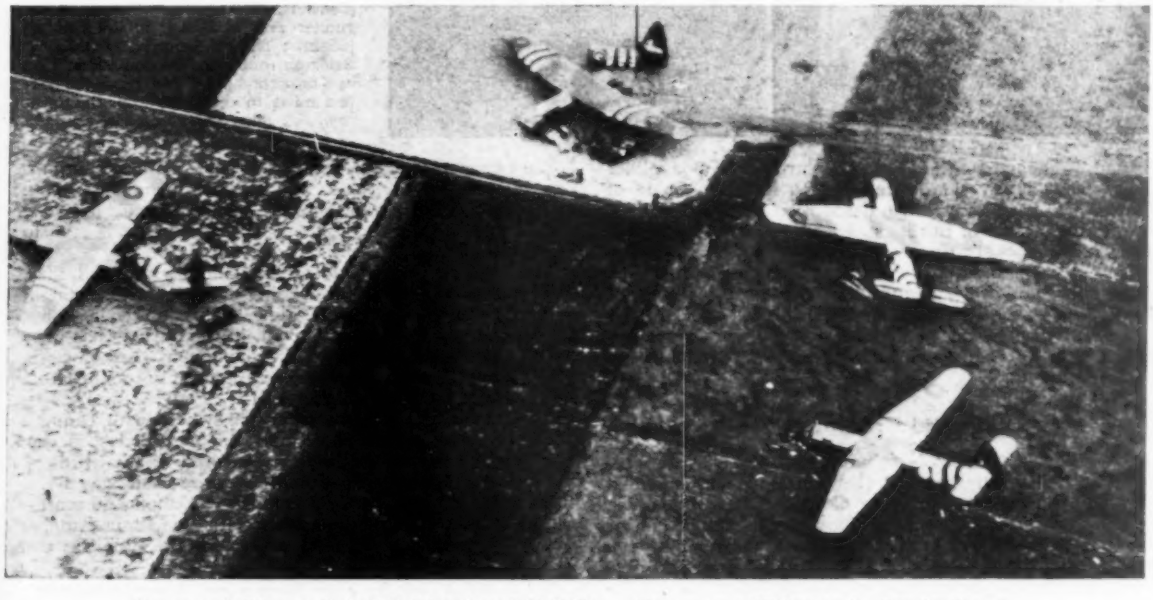
Just as I think of this strain on the tow-rope, there, right in front, one breaks and the two units are able to land at their own airfield to try again later.

The grey mist of an autumn morning now begins to rise under the warming influence of the rising sun. Great cumulus clouds form with anvil tops, and help to make a picture exquisite in the extreme. The green and brown fields; the late harvests, cut but not yet gathered; the exquisite clouds and the sky, never so blue; above it all, is almost painful in its beauty. And one's own thoughts in such circumstances and on such an occasion, what are they as we sweep over the green English countryside on a Sabbath morn?

An Air Crusade

A sense of spiritual elevation is here. The sky is filled with the power of Great Britain. How truly great Britain is. She saw a great light in 1939 and has followed it ever since without wavering and without counting the cost, either in money or in blood. Never will there be a greater crusade with a purer motive than this huge airborne army of liberation winging its way to Europe. Even the badge of the Army of Liberation is singularly appropriate for this operation. It will be remembered that it portrays the flaming sword of liberation surmounted by the rainbow of promise and, above all, by a blue sky. The rainbow has long stood for the promise that there shall never be another flood. Truly Holland needs that assurance to-day.

These clouds, however, as they build up, make life difficult for the gliders who cannot fly blind. They have an automatic pilot, but no artificial horizon on which to



Close-up of gliders on their D.Z. taken by a P.R. Spitfire. The men are still busy unloading the Horsas.

AIRBORNE OPERATION

C-for-Charm's crew. Top (left): W/O. D. M. Dawe, pilot, from New Zealand. (Centre): P/O. W. J. Old, navigator. (Right): The flight engineer, Flt. Sgt. E. J. Johnson. Bottom (left): Flt. Sgt. A. France, wireless operator. (Centre): P/O. C. W. Walker, rear-gunner and best shot in the Group. (Right): The bomb aimer, W/O. L. F. Peterson, another New Zealander. He acts as second pilot, map reads the last few miles to the D.Z., drops the tow-rope and aims any containers carried.

depend. The nearest equivalent instrument on a glider shows what is facetiously referred to as "the angle of dangle," a very expressive description. To avoid the clouds, the stream of Stirlings and Horsas wind their way through valleys between the peaks.

Presently the East Coast of England shows-up in the cloud gaps, and we pass over a particular piece of East Anglia where, as a humble member of the P.B.I. in the last war, I was once stationed and, to cope with Zeppelins, armed with a Japanese carbine. Allies and weapons are changed to-day.

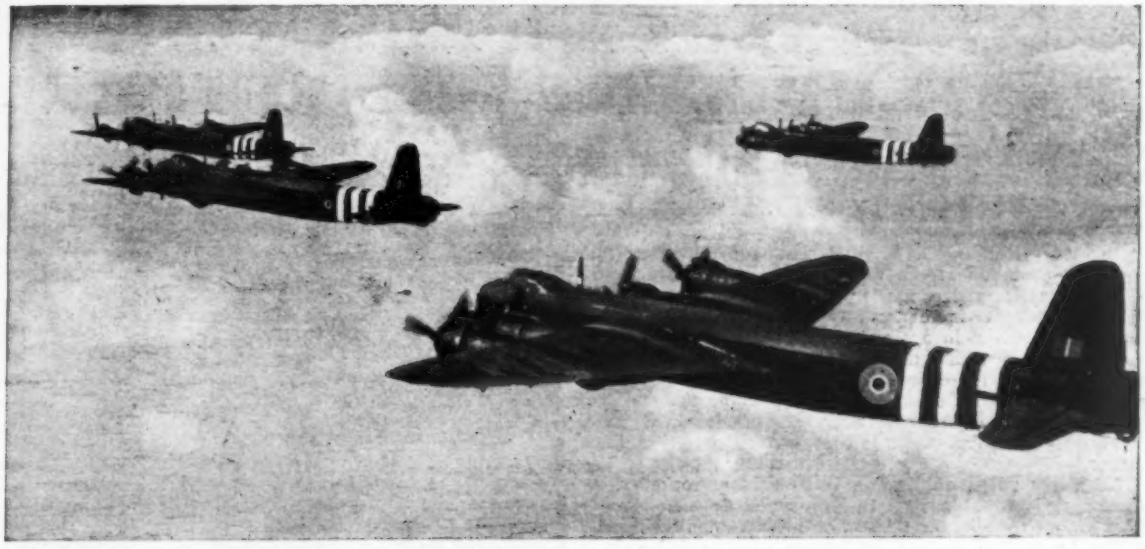
Gliders in the North Sea

Over the sea the clouds thin-out and finally clear altogether. Below, the sea has the appearance of moulded glass, broken only by the wake of the occasional Air/Sea Rescue launches as they tear along to the aid of one or two gliders which are in the water as a result of broken tows. Here the aircraft of A.D.G.B. pick us up and give us fighter-cover over to Holland, where the tactical force based on the Continent takes over the job.

We come in sight of the Dutch coast with 150 m.p.h. showing on the "clock," and with the Hercules doing 2,000 r.p.m. at plus 5 lb. boost. In front another tow-rope breaks and the Stirling orbits the glider until it is seen to be down safely.

The first few miles into Holland are so peaceful that, were it not for the terrible flooding down below, one might think he was on a pre-war airline. This, however, is but for a short while. The inter-com. in the Stirling gets busy as all the aircrew report to the pilot what they can see. The navigator's voice announces light flak coming from an anchored barge in the bend of a canal. Almost as he speaks, a Spitfire appears from somewhere with cannons blazing. In a matter of seconds the A.A. barge is well alight. With apparently twice the speed of the Stirlings, our pathfinders sweep over our heads on their way home from the D.Z. Below, a great flurry of Dakotas go scurrying back, all with their parachute static-line straps hanging out. Away to one side a Halifax towing a Hamilcar can be seen.

All members of the crew keep a weather eye for other aircraft because the air begins to get somewhat thick as



AFTER THE SHOW: Linking up with the wing commander, in *X-for-X-ray*, and formating on the homeward journey.

AIRBORNE OPERATION

we push on towards the dropping zones. The stream closes up and air cover above, below and on both sides, becomes more dense. On the ground a number of fires are burning as we turn north-eastwards to cross the vital waterways of the Rhine delta. A thick haze also hangs over the battle area.

At last the crucial moment arrives. The pilot calls the glider pilot over the inter-com. and wishes him good luck. The pull-off time of the glider in front is given as a warning and, finally, the rear gunner, after making a "let go" signal with the Aldis lamp, calls "glider gone" over the inter-com. We have a short way to go yet to drop clear of the D.Z., our tow rope, which is flailing at the back of the Stirling. In these few moments we get the most flak of the whole journey. It is mostly 40 mm. stuff.

A sharp turn to port with throttles opened wide, and we pass quickly back over the D.Z., where hundreds of gliders, beautifully concentrated, are being unloaded. Engines at 2,200 r.p.m. and 190 m.p.h. showing on the airspeed indicator, and we are soon in apparent peace above the clouds. No; I am wrong. Even this tranquility is spoiled. Away, deep inside Germany, an oil fire sends its filthy black smoke up to make an abscess in the pristine whiteness and to spread westwards in a horrid smear many miles long.

Typhoons and Spitfires appear as from nowhere, and we close up to formate with the wing commander's aircraft for the homeward journey. I go into the transparent nose which has replaced the gun turret of earlier types of Stirling, and revel in the warm sunshine which comes through. Close to the cloud tops a terrific impression of speed is gained—so different from the outward journey, where movement was almost imperceptible. Back over England once more. The landscape looks so friendly; even the heath fires have a lazy tranquility about them, so unlike an equal amount of smoke over the battle area.

As base is approached we can hear the Flying Control officer having the time of his life. Everyone wants to land at once. *F-for-Freddie, E-for-Easy, C-for-Charlie, Q-for-Queenie,* all ask for permission to pancake. Some are sent away on a bearing for a specified time; others are requested to orbit at 3,000ft., 2,500ft., or lower, according to their turn for landing. In the middle of the proceedings a voice interjects, "I bet he's crackers before he gets this lot in." At last, nearly twenty minutes after our arrival over the airdrome, we touch down to make a tail-up landing, characteristic of the Stirling. The high undercarriage makes a good three-pointer almost an impossibility.

A cigarette and a chat, and the crew go off to interrogation, while I drive straight back to London.

SOME ITEMS OF INTEREST

ONLY definite air supremacy could have made this operation and the subsequent reinforcements possible. The biggest problem was to subdue the flak, which was expected to be very intense. Hundreds of fighters and fighter-bombers, armed with rocket projectiles and cannon, flew at zero feet to shoot-up any gun which started firing. Spitfires, Thunderbolts, Typhoons and Mustangs all took part.

There was one Lancaster, all on its own, which was doing a little beating-up. In a most prodigal fashion it appeared to throw 500 lb. bombs at any Germans within view.

The time has come when aircraft should be specially designed for glider-towing and paratroop-dropping. Until now other aircraft, designed for totally different purposes, have had to be adapted to the job. There were Stirlings, Dakotas, Halifaxes and Albemarles doing the towing. Horsa, Hamilcar and Waco gliders were being towed. These came from over 25 airfields spread all over the country—a nice little problem for the man who worked out the timing.

Lt. Gen. Browning, who has been largely responsible for air-borne training in this country, flew in with his troops in a glider. He commands the Airborne Task Force under Field Marshal Montgomery. Lt. Gen. Brereton, who commands the First Allied Airborne Army, of which the Task Force is a part, watched the landings from a Fortress.

Compared with this show, the Germans' air landing in Crete was small beer. They never used more than 100 aircraft at one lift and only about 1,000 sorties were flown.

The two streams on the first day were roughly 125 miles long, and each took about 50 minutes to pass a given point. The streams on the second day were over twice as long—285 miles—and took two hours to pass.

We no longer bother to capture airfields from the air. By blanket-bombing these are made untenable to the enemy, and it is found easier for our airborne engineers to lay fresh strips instead of repairing damaged runways.

Coastal Command, in addition to all their Air-Sea Rescue work, which spread nearly to the Dutch coast, put on a number of diversions to keep the Germans guessing.

According to a very high authority, this tremendous display of strength does not mean that our airborne bolt is by any means fully shot.

Rockets: PAST, PRESENT and FUTURE

An Outline of the Problems and Prospects of Flight in Space

ROCKETS have burst anew on a world already dazed by an inordinately rapid progress in scientific means of destruction. A hundred years ago they were in relatively common use in the armies of the world, but were subsequently displaced by the introduction of rifled artillery giving a more accurate fire. Recently rockets have been revived in an improved form and with better explosive charges for defence against aircraft and for reducing fortified positions. As rocket-launching equipment is only of light weight, it has become possible to equip modern high-speed aircraft, for instance the Typhoon, with rocket projectiles giving a terrific fire power.

Another modern application is to employ rockets for short-period propulsion. Both Russia and Germany have used rockets to assist the take-off of heavily laden bombers.

The book, "Rockets—The Future of Travel Beyond the Stratosphere," recently published by the Viking Press, New York, is therefore well timed. The author is Willy Ley, one of the leading figures of the pre-war German *Verein für Raumschiffahrt* (Society for Space Travel), who is now domiciled in U.S.A. It makes fascinating reading as, although serious in intention and treatment, it is written in language intelligible to non-specialists.

The material in the book readily falls into three sections. The first deals with the early history of the rocket and the speculations of the ancients. This is interwoven with early astronomical and philosophical reasoning and provides interesting background. Secondly, is a more topical account of investigations and proposals for inter-terrestrial travel. In particular there is a detailed first-hand account of the work and experiments of the German Society for Space Travel. The financial and political manœuvres to obtain control of and exploit the findings of this small and enthusiast body of scientific investigators are most revealing. When the Nazis came to power in Germany the Society was soon swept into the "system," put under military control, and the development of rockets rushed ahead under conditions of complete secrecy.

As might be expected, members of the Society were not uniformly amenable to the close watching and regimentation of the Nazi Party. Some, in fact, were opposed to the new regime, found it impossible to continue their activities and, as a result of the pressure put upon them, deemed it necessary to leave Germany. The author went to U.S.A. Some of the men behind the Nazi rocket-type "secret weapons," both those already in use and those threatened, are the more pliable members of the old Society for Space Travel.

Travel Beyond the Stratosphere

The largest section deals with the more peaceful application of the rocket to the possibility of flight in space. Whilst the author may justifiably be termed an enthusiast, his examination of the problem is commendably free from the easy and sensational assumptions of some exponents of space travel. He neither minimises the enormous difficulties to be overcome nor ignores the less spectacular steps by which the problem must be approached in the light of our present knowledge. He discusses practical designs of rockets for mail transport and for meteorological investigation. The latter would appear to offer considerable advantage, as they would reach higher altitudes in less than one per cent. of the time taken by known types of meteorological balloons.

However, before space flight becomes possible it will be necessary to produce a rocket which can maintain a velocity in excess of 11,200 metres per second (approximately 7 miles per second) for hundreds of miles in order to achieve liberation from the influence of the earth. Then, of course, further problems of far greater magnitude will arise. With the fuels and materials at present available it would not yet seem possible to build a rocket with the requisite mass-ratio of propellant to rocket structure, but it is a reasonable hypothesis for the future.

Mr. Ley's prediction of possible eventual accomplishment is an unmanned rocket to the moon and a manned trip around the moon. This seems an extremely modest and reasonable pronouncement from an astronautical enthusiast.

ROCKETS AND JETS: Mr. Willy Ley, author of the book reviewed herewith, and Mr. G. Geoffrey Smith, our Managing Editor, met for the first time in New York recently. Both are staunch advocates of recoil propulsion.

BETTER RELATIONS

FROM reports reaching us from the United States of America it would appear that our Managing Editor, Mr. Geoffrey Smith, is doing great work in promoting a better understanding between our two countries. Already he has addressed nearly thirty audiences, and it seems quite clear that he has given America a much better idea of Great Britain's contribution to the war effort than she has ever had.

Newspapers in the U.S. were in the past somewhat prone to overlook the tremendous achievements of our small country, purely through lack of information. We deliberately avoid the use of the word "propaganda" because it smacks of making believe that which is not true. Mr. Smith has not had to depend on "high-pressure sales talk." All he has needed to do, and all he has done, is to present the true facts to his audiences. This he has done simply and without embellishments, and as a result thousands of Americans are beginning to change their views. We take a not unnatural pride in the fact that if the expression "Perfidious Albion" disappears from the American language the credit will be very largely that of *Flight's* unofficial ambassador.

All that our two nations need for harmonious partnership is a true understanding of one another's problems, needs, achievements and peculiarities. With that understanding established—and it is essential to future world peace—there is nothing we cannot accomplish together.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

No Traffic

SWISSAIR has suspended until further notice its air service between Zürich and Stuttgart.

Field Air Mail

THE German field air mail has flown 4 million kilometres since its inception a few years ago. The flying time of all air mail services for forces in the field averaged a daily total of ten to twelve hours.

Map-gazing Dangerous

"ALL our present measures are based on our decision to win the war no matter how, and therefore we must not be tempted to guess at the issue of the war from maps." (A North German paper.)

Recruiting

A RECRUITING appeal for A.A. units has been organised by the German military authorities in Slovakia. The bait of pay equal to that of the German soldiers is held out to the unwilling Slovaks. But no pretence is made of appealing to their patriotic sentiments or the defence of the "New Europe": a recruiting announcement simply says that "those who join the partisans have neither money, nor cigarettes nor food. . . ."

Incident

THE Swedish Home Service reports that the Finnish Helsinki-Stockholm air liner was fired at by two destroyers on the 17th inst., when it was over the sea between Finland and Sweden.

The aircraft, which had passengers on board, veered to the north and arrived with a delay of thirty minutes but unharmed at Bromma airport (Stockholm). It returned afterwards on scheduled time and without incident to Finland.

According to an arrangement between the Swedish and Finnish Governments, the service is operated by Finnish aircraft.

Flashlights from Germany

"THE battle for France would have taken quite a different course if Germany had another three air fleets and ten armoured divisions at her disposal," says the *Kölnische Zeitung*, and another article in a leading daily prepares the public for the coming events: "Frontier posts," it says, "need not necessarily coincide with the natural advantages of the terrain when it's a question of operative plans." . . .

The German press, while announcing in unison that the Allies have but the material superiority (the spiritual forces being on Germany's side), is nevertheless in a grim mood. "The hammer of fate strikes hard against us," says an article. "Bleeding divisions retire. Low-flying enemy aircraft penetrate far into our territory. There is certainly cause for apprehension, and the time has come to worry."

And the remedy? *Das Schwarze Korps*, organ of the infamous Nazi "elite" formation, answers: "What is demanded to-day of the German people is a volcanic eruption of a kind which the world has never seen so far." But in Essen one is more realistic; the *Rheinisch Westfalische Zeitung* writes: "In view of the fact that Germany cannot possibly keep pace with the tremendous enemy war potential, her chances consist of creating revolutionary weapons. This has, and still does, cost tremendous and long efforts, and it is clear that every setback and subsequent material loss naturally causes delay—only the future will reveal the tremendous difficulties which had to be overcome."

Gonged and Gone

WITH the cease fire at Brest the career of yet another *Luftwaffe* General came to an end: Lt. Gen. Ramcke, commander of the fallen fortress, joined the parachute formations of the *Luftwaffe* at the age of 51, and took part in the Battle for Crete as a Colonel of a regiment which captured the Maleme airfield.

Luftwaffe Ramcke.

During the North African campaign he was decorated by Hitler with the Knights Cross insignia to the Iron Cross, and for his defence of Brest—the German Agency announces—he was awarded the Oak Leaves with Swords and Diamonds.

Grounded

FOR some members of the *Luftwaffe*, fighting in the Belfort sector must have been a grim disappointment. For instead of Focke-Wulf 190s they were given bayonets and received their baptism of fire in the prosaic infantry fighting against American troops.

These newly formed infantry formations composed of 17 to 18 years old *Luftwaffe* men are said to have been used in German counter attacks and to have fought with great tenacity.

The 70's

BERLIN radio, quoted by Reuter, gave this picture of a "backs-to-the-wall" Germany to-day:—

"The people of town and countryside are determined not to give up an inch of their home soil without a fight.

"It is no longer a secret—many divisions have been freed by the new drafts sent into German war factories.

"Men in their 70s are volunteering. Now that everything is at stake, they say, they do not want to stand aside. People are voluntarily doing overtime, which has generally become known as 'Panzer shifts.'

"The soldiers at the front ought to know it—they must know it—that a fanaticism of work has seized the Home Country.

"There will be no second November, 1918."

Closing Time

"AS a further total mobilisation measure, eight German universities and sixty-three faculties of the remaining universities will completely close down.

"In addition a further thirty-nine faculties are to close down at the end of the winter term 1944-45."

Training

ALREADY before the war the *Luftwaffe* had set up technical preparatory schools with the aim of guaranteeing future skilled technicians for the *Luftwaffe*. The boys received training as metal aircraft constructors, air engine fitters, aircraft electricians and armourers.

The organisation of these technical preparatory schools has now been changed. In future, the *Luftwaffe* technicians in training will be concentrated in hostels of the Flying Hitler Youth and will be educated according to directives issued by the Reich Youth Directorate, the training hostels being directly subordinated to its Department for Pre-Military Training.

The Reich Air Minister, as master of the *Luftwaffe* technician-apprentices—hitherto called military pupils—continues to act as the authority for the vocational training in training—workshops and factories of the aircraft industry.

The apprentices receive an instruction of three years in one of the above vocations and finish up with the skilled worker's examination. The Reich Air Minister directs the instruction in the training workshop, vocational school and factory, in conjunction with the Provincial Labour Offices, selects the *Luftwaffe* technician apprentices throughout the Reich and is responsible for posting them to the *Luftwaffe*.

The Reich Youth Leader, on the other hand, is in charge of education, instruction and schooling in the hostels.

Das Junge Deutschland publishes two investigation reports which show the superiority of the boys' education and care in the hostels of the technical preparatory schools, particularly with regard to physical and intellectual development, as compared with groups of juveniles of the same vocation who do not live in hostels.

In the year in which the investigation was carried out their average weight was 63.79 kg., that of the others only 54.2 kg., although both groups received the same food rations. The military pupils had no defects of carriage, etc., during the year of observation, whereas the group which did not live in hostels showed a tendency towards flat feet, varicose veins and "fitter's hump." The military pupils showed a higher average standard, especially in the theoretical part of their training.

Air-cooled Engines

Possible Developments and Some Problems Likely to be Encountered in Large Power Plants : 6,000 b.h.p. Within the Next Seven Years

By B. G. MARKHAM, M.A., A.F.R.Ae.S., A.M.I.A.E.

IN his recent lecture to the R.Ae.S., Mr. Markham first examined the probable requirements for engines of increased power in the next seven years and then, after a short reference to the possible limitations imposed by the airscrew and a short historical note on developments in the 1920s, an outline was given of the probable increases in specific powers during the next seven years, and subsequently, specific problems involved in the design of the larger engines envisaged.

It was believed that if engines of the 3,000 to 4,000 h.p. class were available at the present time, they would be accepted by designers of single-seater fighters. Engines capable of giving these powers on present-day fuels and b.m.e.p.s could, it was thought, be developed to give 4,500 to 6,000 h.p. within the next seven years, and this would probably meet the fighter requirements for this period.

Bombers in the present-day heavy-bomber class would, in the near future, no doubt use engines of about 3,000 h.p., and these engines would be developed to give a substantial increase in power, although possibly not to the same extent as those used in fighter aircraft.

For very heavy aircraft of the order of 100 tons weight, which was about the maximum which could prudently be designed with the knowledge and experience at present available, good use could undoubtedly be made of engines of the 5,000/6,000 h.p. class. The time taken to design and produce prototype aircraft of this size meant that such engines were not required immediately. For aircraft of this class there would be competition from the development of coupled engines. That is, the use of twice the number of engines, each of half the power, coupled together and driving concentric contra-rotating airscrews. Such an arrangement started off with the solid advantage of using a form of power plant which could almost certainly be developed more quickly than the single high-power engine, and it should gain something in reliability.

Coupled engines could almost certainly be more easily buried in the wings and they might have some small advantage in reduced drag for this reason, although they would probably have to pay a small weight penalty.

For aircraft of 100 tons there was also the possibility of using two pairs of 5,000 to 6,000 h.p. engines, and this would entail the development of contra-rotating airscrews capable of handling 10,000 to 12,000 h.p. It was probable that the bulk of these engines would outweigh the advantages in the smaller area of disturbed flow over the wings, but the possibility was mentioned as it presents about the maximum h.p. per airscrew likely to be required.

The sizes of airscrews required for the powers envisaged were as follows:—

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H.P	Up to 20,000ft.	Up to 35,000ft.
3,000	13ft. dia. 6-blade contra-prop.	17ft. dia. 6-blade contra-prop.
6,000	16ft. dia. 8-blade contra-prop.	20ft. dia. 8-blade contra-prop.
10,000	20ft. dia. 8-blade contra-prop.	Two 22ft. dia. 6-blade co-axial contra-props (1-Tractor, 1-Pusher).

MR. MARKHAM is head of the Technical Department, Aero-Engine Division of the Bristol Aircraft Co. Ltd., and this article is a résumé of his paper entitled "Possible development in the design of air-cooled engines with particular reference to the problems to be faced in increase in size" recently read by the author before the Royal Aeronautical Society.

None of these was in any way impracticable, although that suggested for the highest power was unconventional and indicated the difficulty of dealing with very high powers at great altitudes.

For aircraft with speeds approaching 500 m.p.h. these suggestions would have to be modified to avoid compressibility effects. For speeds much above this figure, it was unlikely that the highest-power reciprocating engine would be able successfully to compete with gas turbines or jet-propelled aircraft.

Soon after the last war, Mr. Markham continued, an attempt was made to develop a number of large engines of about 1,000 h.p., and the best known of these was probably the Napier Cub.

It is interesting to note that none of them was really successful, and the first engines produced in large quantities to give powers approaching 1,000 h.p. were the Bristol Pegasus and the Rolls-Royce Kestrel which were developed from the Jupiter and the Eagle respectively of similar swept volumes which, in 1922, gave about 380 h.p.

It is apparent that in the post-1914 war period sufficient allowance was not made for the possibilities of meeting the growing power requirements of aircraft by boosting up engines of existing sizes, but in the period between 1922 and 1934, specific powers increased by about 150 per cent. About a third of this was due to increased piston speed, and the rest to better fuels and supercharging.

The improved fuels giving higher knock ratings under both weak-mixture and rich-mixture conditions which, it is believed, will become available in the next few years, may be used either to allow higher boost pressures to be used at existing compression ratios, or to enable improved specific fuel consumption to be obtained by the adoption of higher compression ratios.

Influence of Compression Ratio

Apart from the question of fuel consumption, a higher compression ratio obtained by increasing the thermal efficiency simplifies the cooling problem, and this may be of considerable advantage in certain types of engines. In addition, since the size of cylinder for a given power output must be greater with a high compression ratio, additional cooling area can be obtained. These two factors may allow an appreciable reduction in the internal cooling drag of the engine. On the other hand, the greater bulk of the high-compression engine may increase the form drag and more than offset any reduction in cooling drag.

It is impossible to generalise on this because on certain aircraft the diameter of the engine nacelle is determined by the space required for the retractable undercarriage and not by the engine diameter. On other installations, however, it may be possible to submerge a small highly-boosted low-compression engine in the aircraft wing and so obtain a considerable reduction in drag. For the purposes of the following comparisons, it is proposed to neglect any change in drag due to change in compression ratio.

It is not proposed to go into all the factors affecting fuel consumption, but it is impossible to discuss the probable increase in specific powers without considering the probable trends in the compression ratios which will be used.

Fig. 1 shows the variation in fuel weight plotted against

compression ratio, and also the effect of compression ratio on the weight of the power plant. In estimating the change in weight with compression ratio it is assumed that as the compression is raised the swept volume is increased in proportion to the reduction in b.m.e.p. so as to maintain a constant power output.

It is assumed that at 7 : 1 compression ratio the weight of those parts of the power plant affected by the change in size of the engine is 3,000 lb. for a cruising power under economical low r.p.m. conditions of 1,000 b.h.p. It is also assumed that the weight of these parts will vary directly as the swept volume.

Fig. 2 shows the difference between the change in power-plant weight and fuel weight, or in other words the change in pay load with compression ratio.

Cost of High Compression

For a rated height, under weak-mixture cruising conditions of 15,000ft., the saving in fuel on a 10-hour flight at 1,000 h.p., resulting in a change from 7 : 1 to 8 : 1, will be of the order of 270 lb. On the other hand, the specific power of the engine for a given fuel will be reduced because the boost pressure will have to be lower to avoid detonation. Making due allowance for the reduced power to drive the blower, the reduction will be of the order of 14 per cent., whilst the maximum cylinder pressures will be about the same on both engines, possibly a little higher on the high-compression, low-boost type. The increase in weight of the high-compression engine is, therefore, likely to be roughly in proportion to the reduction in specific power. Assuming an engine cruising at 50 per cent. maximum power, the increase in installed weight, including lubricating oil tanks, etc., would be of the order of 430 lb. On a commercial basis, therefore, it would be necessary to assess the net loss in pay load of 160 lb. against the cost of the fuel saved; about 30 shillings.

Generally speaking, it does not seem that very high compression ratios will be worth while, even in commercial operations, except for flights of over 15 hours' duration. Special high-compression engines may be made for Coastal Command aircraft for anti-submarine patrol purposes where very long endurance is required, but in general, it is believed that compression ratios will remain much as at present. On this assumption we can examine the probable

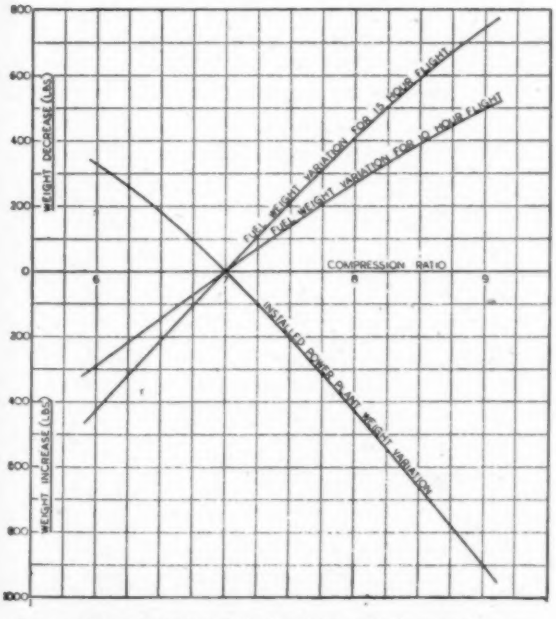

Fig. 1. Power-plant and fuel-weight variations with compression ratio, assuming 2,000 h.p. engine cruising at 50 per cent. maximum power, and taking 7 : 1 compression ratio as basis for comparison.

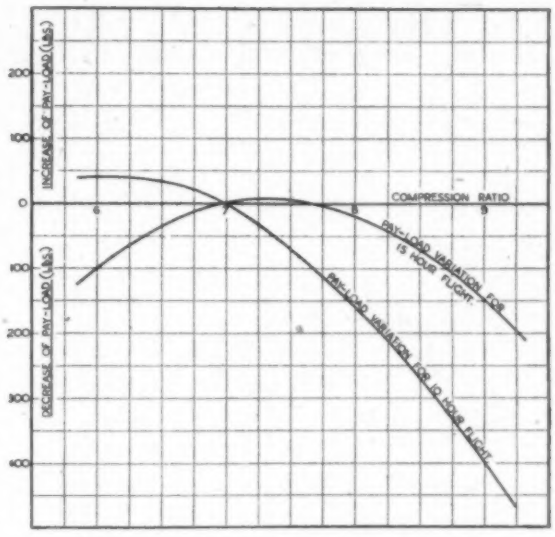

Fig. 2. Pay-load variation with compression ratio, assuming 2,000 h.p. engine cruising at 50 per cent. maximum power, and taking 7 : 1 compression ratio as basis for comparison.

increase in specific powers during the next seven years.

Soon after the war, using existing refining equipment and technique, but at a lower rate of production, it will be possible to produce fuel capable of giving a 30 per cent. increase in b.m.e.p. without increase in lead content. Some five years after this we can confidently expect to get new fuels capable of giving at least a 50 per cent. better b.m.e.p. than the present-day 100 Octane fuel at the same induction temperature. This does not, of course, mean a 50 per cent. increase in power at any particular altitude, as higher blower compression ratios will be required to obtain the necessary boost pressures at altitude.

Fig. 3 shows the power obtainable from a given fuel at constant impeller tip speed, plotted against the corresponding power developed when the blower speed is increased to maintain a constant rated altitude of 15,000ft., both with and without after-coolers. It is assumed that the cylinder compression ratio remains constant. It will be seen that with a 50 per cent. improvement in fuel and after-cooling, one can realise an increase in power of 35 per cent. at constant height. This curve also shows the increasing value of after-cooling at a fixed rated height with improved fuels.

Fig. 4 shows the relationship between b.m.e.p. and maximum cylinder pressure for normal ignition timings. This can be somewhat modified by the use of very rich mixtures, such as are currently used for maximum power on air-cooled engines. The high-cylinder pressures will mean an increase in the weight of reciprocating parts, and this will mean bigger inertia loads on bearings when running at light loads. At high loads the increased gas pressures will help to off-set these loads.

42 p.c. Power Increase in Five Years

Present-day sleeve-valve engines have excellent breathing characteristics as shown in Fig. 5, and, providing airscrew and boost controls are interconnected so as to avoid the combination of light loads and high r.p.m., I think we can usefully look for a modest increase in piston speeds on existing radial engines. I think probably between five and ten per cent. in the next seven years giving, let us say, five per cent. increase in power due to higher speeds.

The total increase in power that we can expect, say, five years after the end of the war is therefore about 42 per cent., so that engines at present giving 2,000 h.p. will by then be in the 3,000 h.p. class. An engine giving

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4,000 h.p. at present-day b.m.e.p. and speeds may be expected to meet the requirements for a 5,000 to 6,000 h.p. engine in the period we are considering.

As may be seen in Table I, all modern high-duty aircraft engines at present give about 4.8 h.p. per sq. in. of piston area, regardless of type. A figure of 5 h.p. per sq. in. represents the best attainable with normal design and, on this basis, a 4,000 h.p. engine will require about 800 sq. in. of piston area, and this could be obtained with any of the cylinder arrangements shown in Table II. Engines of these sizes would give about 5,700 h.p. in seven years time.

All the cylinder arrangements shown, except the 32- and 48-cylinder, have been run in recent years and, although for any one purpose there is presumably only one optimum design, any of the above number of cylinders from 18 to 32 is entirely practicable for an air-cooled engine of this size.

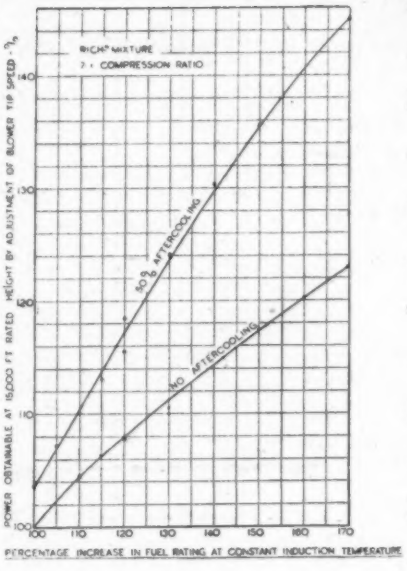

Fig. 3 (above). Possible increase in power at constant height with improved fuels.

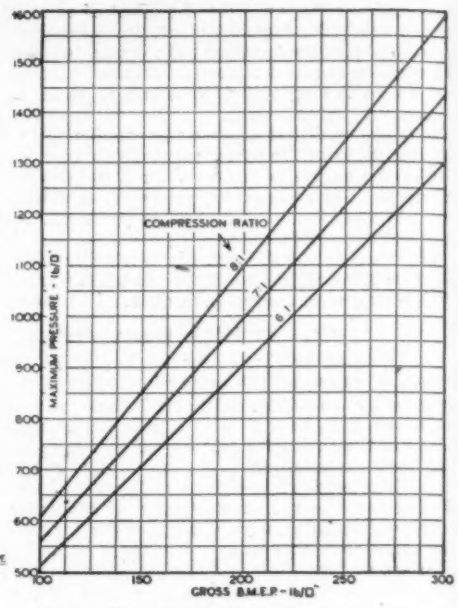

Fig. 4. Relationship of maximum to mean cylinder pressures.

The H-engines would, of course, require two crankshafts geared together. I think on the 32 X and the 32-cylinder four-crank radial it would be desirable to use two shafts with the reduction gear in the centre. If this system is not adopted the 32-cylinder X engine shaft becomes very long and torsional vibration difficulties are considerable.

In the case of the four-crank radial the advantage is that it halves the power to be transmitted through the maneton joints. A split master rod for more than seven cylinders per crank is impracticable, so one must have a build-up shaft.

Sleeve-valve Engine Design

Of the radial arrangements the 18-cylinder or the 28-cylinder seems the obvious choice. I believe that most engineers would go for the 28-cylinder and, given equal skill in design and development, I believe it would prove the best. I don't think, however, there is anything impracticable in the 18-cylinder, large-bore engine. The 21-cylinder does not offer enough reduction in cylinder bore to justify the extra complication, and I think that the 22-cylinder imposes too many difficulties in master-rod and big-end bearing design for an engine which is to run at the speeds which modern single-sleeve valve design makes possible.

I will now consider the air-cooled radial sleeve-valve type in relation to the problems to be faced in regard to the increase in specific power and increase in cylinder size. The problems are due to increased cylinder pressures, increased speed and higher rates of heat dissipation

Better detail design and manufacture of reduction gears will allow substantial increases in stress over accepted British radial engine practice, and we may gain a little from better steels. There is an urgent need for reliable nitrided steels of high core strength and the greatest surface hardness that can be combined with resistance to flaking or chipping. Work on such a steel was instigated by the Bristol Co. some six years ago, and should bear fruit in the period under consideration.

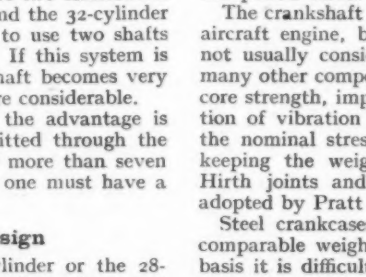

Fig. 5. Volumetric efficiency from engine tests at ground level and zero boost, corrected for constant induction temperature of 100 deg. C. (Hercules engine).

The crankshaft is one of the heaviest components of any aircraft engine, but it is so important that its design is not usually considered in relation to weight so much as many other components. In the future, material of higher core strength, improved quality forgings, and full exploitation of vibration dampers will have to be used to allow the nominal stresses to be raised. Other possibilities of keeping the weight in bounds are the development of Hirth joints and the use of plain journal bearings as adopted by Pratt and Whitney.

Steel crankcases can be made strength for strength of comparable weight with those of light alloy, but on this basis it is difficult to get sufficient rigidity. To obtain a smooth-running engine with high gas pressures this question of crankcase stiffness may well become critical.

The Bristol Company is in the unique and happy position of being able to use ordinary good quality tin base white-metal for big-end bearings. This material is almost completely resistant to bearing corrosion and is very tolerant of dirt. Its fatigue resistance is, however, relatively low. Fatigue stresses have been avoided by having the bearing-metal on a sleeve fixed to the crankpin, and this is so rigid that the stresses due to flexure are negligible. On the most highly loaded point the pressure has only a cyclic variation of about 20 per cent. If the white-metal was on the master-rod bore, the load at any point would vary from zero to maximum every revolution and fatigue would occur.

From all points of view cooling of the piston is a major factor. Cooling controls the tendency for ring gumming and the piston strength. American practice is to use an open design of piston which is well ventilated and gives any oil splashing around easy access to the crown. However, a long gudgeon pin is necessary and a long pin must be of large outside diameter

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to resist bending loads, but to be reasonably light it must also have a large bore. Such a pin is therefore lacking in resistance to ovalling and may fail from this cause, quite apart from the bad effect on the piston. British designers prefer to use a short, stiff gudgeon pin of comparatively small diameter.

A sleeve-valve engine piston is at some slight disadvantage in that cooling through the cylinder is less effective because of the double oil film and the sleeve. This must not, however, be exaggerated and the sleeve is, in fact, surprisingly transfusive of heat. Because of the inherently lower lateral heat flow on a sleeve-valve engine the increase in the severity of the cooling problem with increase in bore is not so great as on a poppet-valve type.

Oil jets play on the piston-pin bosses, and as these are a highly stressed part of the piston this is quite a good feature. However, with large bores more direct cooling of the crown may be found necessary, and we must expect drilled connecting rods feeding a jet of oil on to the centre of the piston if bores exceed, say, 6½ or 7 inches.

Salt-cooled pistons have been proposed. There are practical difficulties with corrosion and erosion, but in any case, as I see it, they are fundamentally bad as they increase the temperature of both piston skirt and rings which are already hot enough. The right solution for big pistons is

TABLE I.—MAXIMUM B.H.P. PER SQ. INCH PISTON AREA
Current Engines using 100 Octane Fuel

Engine	Bore (in.)	Total Piston Area (sq. in.)	B.H.P.	B.H.P. per sq. in. Piston Area
Sabre	5.00	471	2,200	4.67
Merlin	5.40	275	1,400	5.09
Griffon	6.00	340	—	—
Wright Tornado	4.25	596	2,350	3.94
P. & W. R2800 ..	5.75	467	2,000	4.28
Wright R3350 ..	6.125	531	2,300	4.33
Hercules ..	5.75	364	1,700	4.67

not to pass excessive quantities of heat through the piston skirt, but to rely on direct oil-cooling of the crown.

The junk head involves very similar problems to the piston, and recent development has been towards improving the direct air-cooling with less reliance on conduction radially through the sleeve and barrel.

Modern liquid-cooled installations have extremely low cooling drag; they may even give a small thrust under certain conditions of flight in temperate climates. Some further aerodynamic improvements allied with neater and less vulnerable installations will, no doubt, be introduced for present-day engines. Possibly, however, the greatest reduction in the cooling drag of liquid-cooled engines is likely to come from the use of higher coolant temperatures. An attempt will undoubtedly be made to achieve these, with the smallest possible increase in cylinder temperatures, by increased coolant velocities and perhaps some local finning or secondary surface on the head.

Radial Engine Drag

Modern air-cooled engine installations also have extremely low cooling drags, the best at the present time approaching the condition of zero cooling drag under I.C.A.N. conditions. In practice, they give less trouble with ground-cooling in the tropics and, at a sacrifice in overhaul life, have a large capacity for overload. On the other hand, a liquid-cooled engine's limitations are far less elastic, and radiator boiling sets a definite limit.

However, to return to the matter of drag. The air-cooled engine can expect to gain as much from improvements in cowling and rather more from the use of higher temperatures. In addition, there is a very large potential

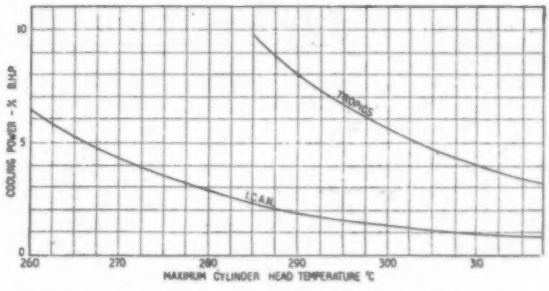


Fig. 6. Cooling drag at varying maximum cylinder temperatures. Percentage b.h.p. required for cooling a high-power, air-cooled radial engine installed in a high-speed aircraft.

improvement possible by better finning. Fig. 6 shows how drag is reduced by higher operating temperatures on a given cylinder.

The reduction in drag is due almost entirely to the higher fin-temperature, and the reduction in heat dissipated is negligible. In this case the higher fin-temperature is obtained by increasing the mean operating temperature of the head. There are three other ways of raising the average fin-temperature.

(1) Using fins of higher conductivity.

(2) Reducing the depth of cool fins on those parts where the cooling is greater than need be.

(3) There is a tendency to neglect (2) and to concentrate on improving the cooling of the hot parts of the head. If this can be done (and in practice it always can!) the temperature of the over-cooled portions can be raised by a reduction of the air-pressure drop across the engine.

The cooling of an engine can, as is well known, produce a useful thrust. The principle is to take in air, compress it, heat it and then allow it to expand and eject it rearwards.

Advantage of Air-cooling at High Speeds

The compression is caused by the speed of flight, possibly assisted by a fan. If an air-cooled engine is carefully baffled and finned, so that no air gets by without doing its job and no parts of the cylinder are unnecessarily cooled, the air-cooled engine can produce a greater air-temperature rise. Further, since the difference between the metal and air temperature is higher, the unavoidable friction associated with the transfer of heat is less. These factors give the air-cooled engine a theoretical advantage at high speeds where cooling thrust is not at all negligible. It is a matter of design to see that this basic advantage is not squandered in excessive duct losses, etc. The importance of keeping

TABLE II.—POSSIBLE CYLINDER ARRANGEMENTS
For engines having Piston Area of 800 sq. in. to give 4,000 B.H.P. with present-day fuels and 5,500-6,000 B.H.P. in seven years' time

Number of Cylinders	Cylinder Bore (in.)	Possible Cylinder Arrangements
9	10.6	Radial.
12	9.2	V, W or flat.
14	8.5	Radial.
16	8.0	H, V, X or 2-crank radial.
18	7.5	2-crank radial or W.
21	7.0	3-crank radial.
22	6.8	2-crank radial.
24	6.5	H, X, W or W.
28	6.0	4-crank radial.
32	5.6	H,* X,* W* or 4-crank radial.*
42	4.8	6-crank radial.
48	4.6	WW "Double W" 4-crankshafts.*

* No engine with this arrangement has been built.

AIR-COOLED ENGINES

these duct losses down to the minimum may influence the geometric layout of the engine, and in this connection the conventional entry may give way to the use of leading-edge ducts.

Air-cooled engines, because of the greater temperature difference between air and metal, are less affected by tropical temperatures than liquid-cooled engines. It follows that they also do not gain as much from the lower temperatures at very high altitudes, and it might be expected that at extreme altitudes liquid-cooling would be easier.

Fortunately for the air-cooled engine, it is also less affected by the reduced mass-flow with rarefied air than is a radiator. On sleeve-valve air-cooled cylinders the temperature difference varies as the mass-flow to the 0.4 to 0.5 power. The corresponding index for a normal radiator is about 0.7. The net result is that air-cooled engines can be cooled at rated altitudes of 35,000ft. as easily as at ground level, whereas the provision of a radiator for cooling a 5,000 h.p. engine in fighter aircraft at this height is a major installation problem.

Summing up, the present best air-cooled installations, apart from any practical advantages, have at present a drag which is no higher than that of liquid-cooled engines under temperate conditions, and may be lower under tropical conditions.

There is more scope for improvement in air-cooling since liquid-cooled installations have already attained a very high standard of duct and radiator efficiency.

Both air- and liquid-cooled engines will in the future have such low cooling-drags that this is not likely to be a determining factor in choosing the cooling medium.

It is thought that for very high powers in fighter aircraft the air-cooled engine will prove the most acceptable because of the difficulty of finding room for large enough radiators.

AIRCRAFT ENGINEERS' LICENCES

THE Air Registration Board has just issued two notices to "Licensed Aircraft Engineers and Owners of Civil Aircraft." The first reminds its readers that the Board has taken over from the Air Ministry the duties of formulating and publishing technical requirements relating to the design, construction and maintenance of civil aircraft, that previously issued Air Ministry notices on the subject are cancelled, and that licensed aircraft engineers and owners of civil aircraft can have one free copy of notices issued by the Board.

Notice No. 2 deals with the revised procedure for the granting of licences to aircraft engineers. This was first outlined in a new booklet, "The Duties of a Licensed Aircraft Engineer," issued by the Board in April, 1943, which *Flight* reviewed at the time to the extent of a whole page. The notice just issued states that the Air Navigation Regulations now in course of revision provide for a new form of licence which will be known as an "Aircraft Engineer's Licence," and that full particulars of a revised procedure for and syllabus of examinations (writen and oral) are contained in the Board's Handbook No. 2. This has the same title as the first handbook issued early last year and includes a supplement.

It is explained, however, that this new procedure cannot be fully operative until revision of the regulations is completed and published, and that in the meantime the Board has instituted an interim scheme. This provides for applicants to take a written examination (fee £2) and, if successful, to take the oral part without further fee after the revised regulations have been promulgated. Existing ground engineers' licences will be reviewed and replaced by the new form of licence, either on application or when renewal is sought.

ASSISTED TAKE-OFF: An experimental N.A. Mitchell, with two rocket units under each wing, flying from Wright Field. Although shrouded in wartime secrecy, rockets have been used for assisted take-off and short bursts of extra speed in the air for some years.

International Aviation

U.S. Secretary of State, Cordell Hull, Comments on Bailey Bills

SENATOR JOSIAH W. BAILEY, of North Carolina, who is a Democrat, has submitted to Mr. Cordell Hull, U.S. Secretary of State, two Bills dealing with the subject of international aviation. One, No. 1949, has the snappy title: "A Bill to Create an Independent Civil Aeronautics Authority and an Independent Air Safety Board, to Promote the Development and Safety and to Provide for the Regulation of Civil Aeronautics and to Promote World Leadership by the United States in Aviation." The other, No. 1950, is entitled: "A Bill to Create the All-American Flag Line, Incorporated, and to Assure the United States World Leadership in the Field of Air Transportation." Bold objects, frankly stated.

Mr. Cordell Hull, in his reply, deals with many aspects of the two Bills (they replace between them an earlier Bill, Senate 1790) which are purely of domestic American interest, but some of his comments are highly interesting and significant. On the subject of an All-American Flag Line the Secretary of State says:—

"It is noted that one of the main purposes of the bill is to establish an All-American Flag Line, Incorporated, which presumably would become the single or at least the dominant instrument in the field of United States international air transport.

Reasons for Monopoly

"The Department considers that the question of whether our international air services shall be carried on by a single company or by several companies is primarily a *domestic* matter. At the same time, a number of considerations relating to that question may be of interest, and the Department accordingly feels at liberty to offer certain comments.

"It is so often assumed that most of the leading nations have adopted in full measure the single company principle, and that this was done because of unsatisfactory experience with other alternatives. As a matter of fact the experience of other countries is so varied that very few definite conclusions can be drawn."

The Secretary of State then goes on to point out that some countries adopt the monopoly policy not only for their international but for their domestic services as well. The countries which, before the war, concentrated on one or two companies may, he said, be grouped in three categories: Those having a basic political philosophy favouring State monopoly; those with small geographical homeland areas and distant or widely scattered colonial possessions; and those whose financial resources did not permit them to support more than one enterprise.

"The United States," Mr. Hull continues, "does not fit into any of these groups. On the contrary, our predominant position in world aviation has been achieved through the competitive system; our country is so large that it offers an ideal laboratory for technical and other improvements, and our foreign operations are not intended primarily to connect our outlying positions; and we are not prevented by limited finances from obtaining the benefits of regulated competition or for monopoly depending on its estimate of the effect of such a decision on the future development of its aviation industry and its air commerce."

The experience of other countries, the letter continues, has been that the one "chosen instrument" policy led to a government-owned system, or else to a system so completely government controlled as to have all the qualities of a government ownership. The regularity of this tendency suggests that determination to accept or reject the "chosen instrument" theory might well turn upon whether it were desired to accept or reject the probability of government ownership or government control tantamount to it.

The letter continues:—

"In respect to the relation of a single instrument to the national defence, it is to be noted that Great Britain has made extremely effective use of the single government-controlled British line; equally, the United States has found it possible to use a number of lines; and that all of the American lines in question have reached a high level of operating efficiency over far-flung world routes."

On the subject of the negotiation of agreements Mr. Cordell Hull has a good deal to say. Pan American Airways in the past were well known for their abilities (notably those of Mr. Juan Trippe) in this direction. The Secretary of State does not appear to be wholly in favour of such procedure. Here is what he says:—

"Section 902 (B) provides that 'The secretary of State may negotiate agreements with foreign governments in the name of the United States for the benefit of All-American Flag Lines, Incorporated.' Section 902 (C) implies that the company itself may negotiate with foreign interests and provides that the Department, when requested, shall make available its services and facilities in furtherance of such negotiations. Section 902 (D) provides that the Secretary of State shall not negotiate agreements with any foreign government or foreign national for the benefit of any air carrier engaged in foreign air transportation 'except as herein provided.' Certain considerations as set forth below indicate that these provisions might be undesirable.

"At present the Department and the Civil Aeronautics Board share the opinion that negotiations with foreign governments concerning aviation rights should be undertaken by the government rather than by individual air carriers, although it is recognised that there may be instances wherein exceptions to this principle should be permitted. The statement is sometimes made that landing rights can be obtained by an individual company without committing its government, but this argument is to a large extent outdated and was valid only so long as the foreign government concerned had no interest in having its carriers fly to U.S. territory. In general, reciprocity is inherent in the acquisition of any foreign landing rights, even if they happen to be requested by an individual company. This is evident by the present tendency among leading nations to recognise that the interest of their national air carriers abroad can best be protected through inter-governmental negotiations. Incidentally, this prevents a foreign government from 'paying off' one company against another.

"Pan Am." versus Government

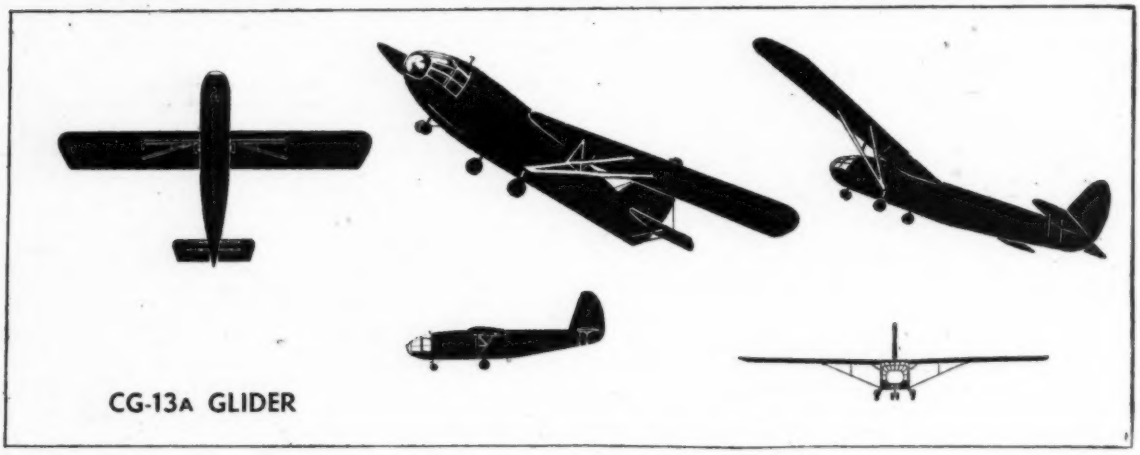
"Another point to be considered is the disparity which sometimes exists between national policy and the activities of individual companies. Pan American Airways System, when it was the single American company in the field of international air transport, usually followed the practice of negotiating with foreign governments as an individual company. With the advent of the war, however, some of the arrangements which the company had made proved to be a deterrent to our war effort and were therefore not in the best interests of this country. While it is assumed that arrangements which would be negotiated by the proposed All-American Flag Line, Incorporated, would conform more closely to our national interest, the freedom delegated by the bill to such a company to undertake its own foreign negotiations might still result in a situation which would be not wholly compatible with government policy or the public interest.

"For the above reasons, it is believed that the Secretary of State should be free to negotiate agreements with foreign governments for the benefit of U.S. air carriers in general and should not be bound to negotiate for one carrier only; and that there should be no legislative mandate which would place the department's facilities at the sole command of a single company without allowing any discretion to the Secretary of State.

"Section 902 (E) provides that foreign agreements described therein are not to be entered into except by Treaty. Section 902 (E) as now drafted would not only make it difficult for this government to participate in certain informal arrangements permissible under the law, and desirable for the development and smooth function of international air navigation, but also would deprive the executive branch of the government of the exercise of reasonable discretion in the conduct of foreign affairs. The Department does not desire to take out of the treaty-making procedure matters which are properly subject there. However, it is necessary that this government should be able in all appropriate cases to participate in international arrangements for the regulation of technical and operational aspects of international aviation without the conclusion of a Treaty."

Studies in Recognition

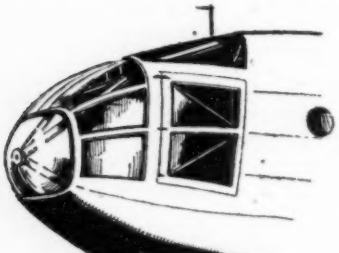
Aircraft in Flying Attitudes



CG-13A GLIDER

PERHAPS the most interesting point about a comparison between the Waco CG-13A and the earlier CG-4A is that although the former is very little larger in overall dimensions than the latter—as a glance at the adjoining silhouettes clearly show—its carrying capacity in terms of troops is just double; it can transport 30 armed and equipped men in addition to the crew, compared with the CG-4A's 15 men. This has been achieved by deepening and widening the fuselage, and by devoting a greater proportion of its slightly increased length to crew or freight accommodation. A somewhat high aspect-ratio wing of slightly greater span is employed, and the CG-13 type can carry a freight load very nearly equal to its own empty weight of just over 4¼ U.S. tons.

It is almost exactly twelve months since work began on the prototype of the CG-13, but it first flew just before Christmas.



The streamlined nose of the Waco CG-13 and 13A "tactical transport" gliders on the U.S.A.A.F. showing the pilots' door and the extensive glazing to give maximum visibility. The attachment point for the nylon tow-rope can be seen in the centre of the nose panel.

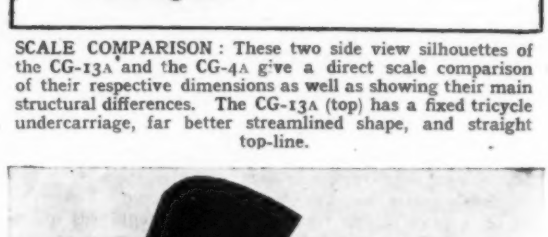
The CG-13 (photograph, top right) was fitted with a conventional type of undercarriage and skids, the main two wheels being jettisonable. The CG-13A, illustrated in silhouettes above, has a tricycle undercarriage and is the first U.S.A.A.F. glider to be so equipped. This landing gear incorporates double nose wheels and, as it is not jettisoned in flight, no skids are required.

The two side views of the respective fuselages of the CG-13A and CG-4A types shown here, illustrate how readily the two can be distinguished from each other from this angle. The larger and later glider (incidentally, it is officially known as a "tactical transport") has a smoothly rounded nose which is almost completely glazed, a perfectly straight top line, and a very large, high aspect-ratio fin and rudder. The smaller glider, however, has only the normal amount of "office window" and a wavy top line caused by the diminished section of the fuselage, aft of the main compartment, which is upswept to the tail; the long dorsal fillet, reminiscent of the B-17 tail, is responsible for this upswept effect in silhouette.

Seen in plan, the difference between the two types are not so marked, but the tailplane of the CG-13A is of appreciably smaller aspect-ratio than that of the CG-4A, and the wings are set further back on the fuselage. Dimensions of the CG-13A are: Span 85ft. 8in., length 54ft. 4in.

Waco CG-13 Glider.

SCALE COMPARISON: These two side view silhouettes of the CG-13A and the CG-4A give a direct scale comparison of their respective dimensions as well as showing their main structural differences. The CG-13A (top) has a fixed tricycle undercarriage, far better streamlined shape, and straight top-line.



Waco CG-4A Hadrian.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"ARTIFICIAL GRAVITY"

Who Invented the Roll?

IN the article by "Indicator" in your August 31st number, entitled "Artificial Gravity," reference is made to the "roll" and the possible inventor of this manœuvre.

I remember seeing it done by Lt. Balcombe-Brown at Upavon in October or November, 1915, in a Bristol Scout. He told me he had worked it out for himself, and after taking the plunge had found it quite easy—a statement not well substantiated by the strange attitudes attained by several other aircraft of the C.F.S. during the next few days!

I wonder if anybody knows of its being done before then.

VERNON BROWN (Air Comdre.).

POST-WAR OWNER PILOTS

The Man with the Red Flag

A DECK-HOOK is, in so far as the writer understands, a piece of equipment attached to an aircraft the function of which is to *slow down* a machine effecting a landing on the deck of a carrier, ultimately bringing it to a *complete standstill* within the narrow confines of such a landing area. It is, therefore, an appropriate nom-de-plume for your correspondent whose very gloomy letter on the subject of "Post-war Owner Pilots" appeared in your issue of September 14th.

In the early days of the automobile the "Deck-Hook" mentality took shape in the form of a man walking in front of a motor vehicle carrying a red flag. He slowed down and almost stopped progress in this field until he was rudely pushed out of the way. If we are to have any real progress in post-war private flying, "Deck-Hook" must be dealt with in a similar manner.

Perhaps we could settle the matter by a small spot of duelling. Even then I shall have been put to a considerable amount of inconvenience chasing around to find me a working penny-farthing bicycle and blunderbuss if I am to meet dear old "Deck-Hook" on anything like equal conditions.

JAMES C. FITZMAURICE.

THEORY OF FLIGHT

Pitch Levers are Wrongly Named

WITH reference to the letter by Mr. R. H. Gardener on airscrew pitch and wind direction in *Flight*, Sept. 7th.

The so-called pitch levers are not pitch levers. They are r.p.m. control levers. After selection of a specified r.p.m. by the pilot, the constant speed unit will maintain that r.p.m. under varying conditions of flight, by altering the pitch of the airscrew blades.

Whether flying into, across, or down wind will not necessitate any alteration of the setting of the r.p.m. control levers. The c.s.u. will alter the pitch of the blades to suit variations of I.A.S., boost or density of the atmosphere. The only thing that the change of state of the wind will do is to alter the aircraft ground speed. If the I.A.S., the boost, and the atmospheric density remain the same, the pitch of the blades will remain unaltered, and the engine will run at the selected r.p.m.

The only occasion on which the r.p.m. control lever settings should be different for any one condition of flight, is in the event of incorrect assembly and setting of the control rods or Teleflex.

R. F. SIMMS.

INVASION TACTICS

Bridges Should be Destroyed

MR. R. HUDSON, in your issue of the 15th June, 1944, has certainly raised a very debatable point from a general view point, but in my opinion I see nothing disturbing in the fact of the destruction of bridges.

In the great Allied air offensive over Northern France, Belgium, Holland and elsewhere, as many as possible of the road and rail bridges in the enemy's rear are being destroyed by Allied aircraft. This destruction might slightly uphold our advance, but there is adequate compensation for this. It should be realised that this elimination of strategic points in the enemy's defensive area means only two things, viz: (a) the greatest difficulty in rushing forward replacements, reserves, ammunition, food and other supplies, e.g., the long overdue train with Allied repatriations; and (b) in the retreat which must necessarily follow bridgeless rivers, ravines, etc., mean the capture or the wiping out of the largest number of the enemy. It is then possible for the advancing victorious army to throw any amount of bridges across because a disorderly retreating or routed enemy does not and cannot hamper this temporary bridging.

One cannot compare the German advances in 1939, '40, '41 and '42 with the Allied advances in 1943-44. In 1939-42 the Germans attacked and overran defenceless countries infested with Fifth Columnists, a factor which the Nazi High Command knew well enough and used to the fullest extent.

G. BORG-MYATT
(Malta).

JET PROPULSION FOR AIRCRAFT

Sonic Speed is Not a Constant

MR. L. SHELFORD BIDWELL is certainly getting down to some fundamental points in jet propulsion in his letter in your issue of August 24th.

I think we shall have to agree to differ about the question of balanced forces since the complete elucidation of the matter, which cannot ignore the motion of the molecules, would take too much space. Where we differ is that I say that the force required to change the direction of motion of the molecules so that they go through the hole *is* the gas pressure on the wall of the combustion chamber, whereas Mr. Bidwell, in effect, says that these two are separate forces which balance each other.

It is not quite correct to say that the driving thrust is the impeller-pressure area of jet. The calculation is not quite as simple as this. I mentioned in my last letter that in actual fact it is greater. The correct figure for the simple case of a convergent nozzle (neglecting friction) is: Thrust $= (1.268p_0 - p_a)$ a lb., where p_0 = absolute chamber pressure in lb./sq. in., p_a = absolute atmosphere in 1 lb./sq. in., a = exit area of nozzle in sq. in. The factor 1.268 is for air with a ratio of specific heats of 1.40.

I have a slight suspicion that Mr. Bidwell is assuming that the speed of sound is a constant. Actually it increases very considerably with temperature. Its value is given by the expression: $c_t = c_0\sqrt{1 + t/273}$, where c_t = the speed of sound at t°C, c_0 = the speed of sound at 0°C = 1,090 ft./sec. for air. Now the temperature of the gases in a gun barrel is very high. I do not know, off hand, the actual figures, but if they are at about 2,000° the speed of sound in them would be about 3,200 ft./sec. This should answer his objection. I think he will remember that I said the limiting speed is the speed of sound in the gas at the temperature in the nozzle.

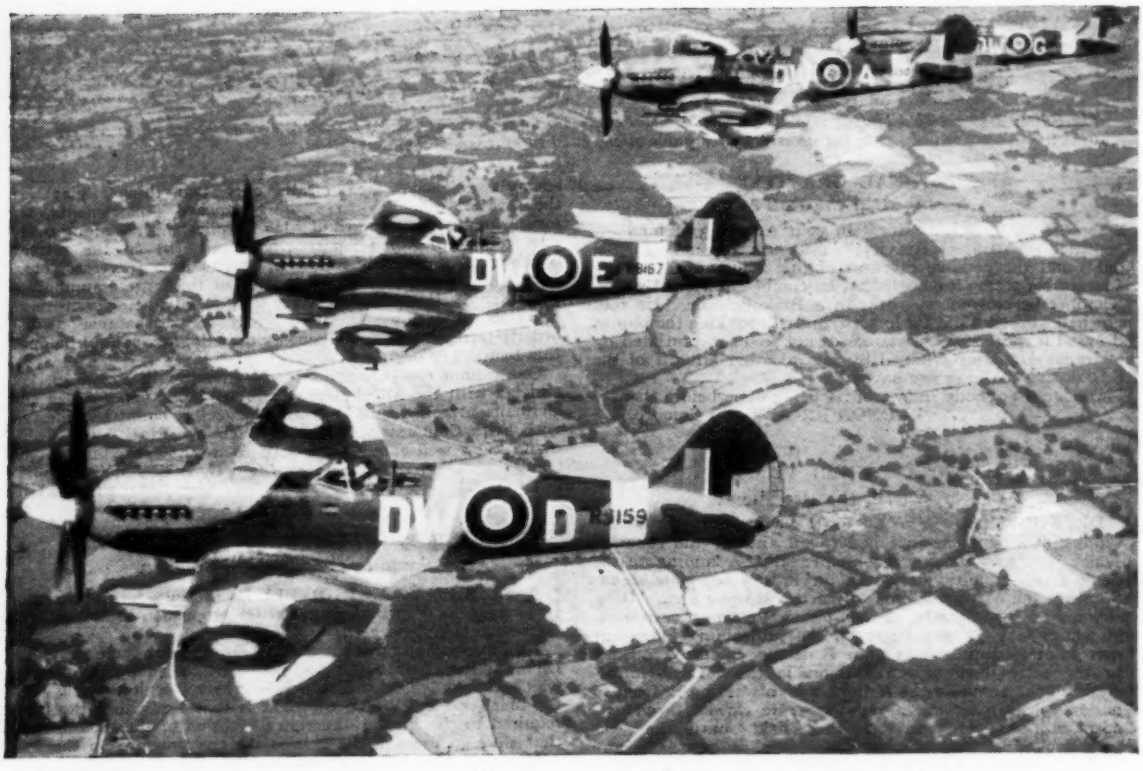
We seem to agree about thrust augmentors—they are a "wash out," in theory and in practice.

May I answer Mr. Maxwell Smith's question in your issue of August 31st as to whether there is any evidence that the speed of sound in air is greater at very high amplitudes? There is plenty of evidence for this. The following are the figures from Wood's "Acoustics" (1943) quoting Angerer and Ladenburg's experiments for the speed of sound at various distances from a 3 Kg. exploding charge (of gun cotton, I think):

Distance from explosion	Speed
3 metres	1,150 m./sec.
6 ,, ...	470 ,,
12 ,, ...	380 ,,
great distances	331 ,,

The conclusions were: (1) near the source the wave velocity is very great—more than three times its normal value, (2) the velocity falls off very rapidly and 9 metres farther from the source it is only about 16 per cent. above its normal value. The explanation usually given is that the air is heated up very considerably in the compression portions of the wave, and since the velocity of sound increases with temperatures we get an increased velocity for the sound wave.

E. BURKE



FOUR FOURTEENS: A section of our latest Spitfire XIVs on patrol. Two new features of this type are the five-bladed airscrew and a redesigned fin and rudder of deeper chord.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

High Command, A.E.A.F.

Act. Air Comdre. C. McK. GRIERSON to be Senior Intelligence Officer, H.Q., A.E.A.F.

Air Comdre. Grierson has been a Director of Operations at the Air Ministry since April last, having previously been at the Directorate of Policy from July, 1943.

Appointments

Air Vice-Marshal W. A. CORYTON, C.B., M.V.O., D.F.C., to be Air Officer Commanding, Third Tactical Air Force, Air Command, South-East Asia, and to be Act. Air Marshal.

Air Comdre. A. R. CHURCHMAN, D.F.C., to be Air Officer Commanding Headquarters, R.A.F., Northern Ireland.

Act. Air Comdre. H. D. JACKMAN, to be Air Officer in Charge of Administration, Air Headquarters, Balkan Air Force, Mediterranean Allied Air Force.

Air Comdre. S. E. STORRAR, C.B.E., to be Air Officer in Charge of Administration, H.Q., Transport Command, and to be Act. Air Vice-Marshal.

Air Comdre. H. T. LYDFORD, A.F.C., to be A.O.C. of a Group in Technical Training Command.

Act. Air Comdre. H. V. SATTERLY, C.B.E., D.F.C., to be a Base Commander.

Group Capt. T. G. SKEATS, C.B.E., to be A.O.C. of a Wing in Maintenance Command and to be Act. Air Comdre.

Group Capt. F. WHITTLE, C.B.E., to be Act. Air Comdre., remaining on the Special Duty List with Messrs. Power Jets, Ltd.

Group Capt. L. J. V. BATES to be a Director of Equipment and to be Act. Air Comdre.

Promotion

GENERAL DUTIES BRANCH.

Air Comdre. (temp.) (Act. Air Vice-Marshal) C. E. V. PORTER, C.B.E., is granted the rank of Air Comdre. (war subs.), August 1st, 1944.

Awards

THE KING has been graciously pleased to give orders for the following promotions in, and appointments to the Most Excellent Order of the British Empire in recognition of services in planning the landings in Normandy:—

K.B.E. (Mil.)

Air Vice-Marshal V. H. TAIT, C.B., O.B.E., R.A.F.

C.B.E. (Mil.)

Air Comdre. A. L. FIDDAMENT, D.F.C., R.A.F.
Act. Air Comdre. W. D. BUDGEN, O.B.E., R.A.F.
Act. Air Comdre. C. S. CADELL, R.A.F.
Group Capt. E. C. FARMAN, R.A.F.
Group Capt. F. C. V. LAWS, O.B.E., R.A.F.
Group Capt. J. E. V. TYZACK, R.A.F.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in execution of air operations:—

Bar to Distinguished Flying Cross

Act. Flt. Lt. L. H. BAVEYSTOCK, D.F.C., D.F.M., R.A.F.V.R., No. 201 Sqn.—This officer and airmen were members of the crew of an aircraft which recently attacked a U-boat. Their attack, faultless in its execution, was pressed home with great vigour and reflects the greatest credit on the skill and gallantry of the captain, Flt. Lt. Baveystock, and also on the efficiency and exemplary conduct of Flt. Sgt. Currie and Sgt. South, who co-operated so well with their leader.

Flt. Lt. D. A. TAYLOR, D.F.C., R.A.F.O., No. 21 Sqn.—Throughout two tours of operations from this country and overseas, Flt. Lt. Taylor has displayed great skill and a fine fighting spirit. On two occasions he has had to fly his damaged aircraft back on one engine, and at all times his courage and devotion to duty have been most praiseworthy.

Wing Cdr. R. W. IREDALE, D.F.C., R.A.A.F., No. 464 Sqn.—On his first tour of operations Wing Cdr. Iredale was awarded the D.F.C. He is now on his second tour and has led his own and other squadrons on numerous successful attacks. His fine fighting spirit and eagerness for action has raised the morale of his squadron to a very high level.

Sqn. Ldr. R. A. BUCKHAM, D.F.C., R.C.A.F., No. 403 Sqn.—During May, 1943, this officer was awarded the D.F.C. Since then he has flown on a great number of sorties and on many occasions has successfully led his wing, sometimes under very adverse weather conditions. He is a fearless leader and has set an inspiring example to those serving under him.

Sqn. Ldr. W. A. G. CONRAD, D.F.C., R.C.A.F., No. 421 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Conrad has made numerous sorties against the enemy. He has destroyed at least seven enemy aircraft and has at all times proved himself to be a highly determined and keen fighter pilot.

Sqn. Ldr. W. G. WISHART, D.F.C., R.A.F.V.R., No. 97 Sqn.—Since being awarded the D.F.C., Sqn. Ldr. Wishart has participated in many more operational sorties. An exceptionally keen navigator, he has never missed an opportunity to fly on a sortie. His coolness and accuracy in the face of heavy odds have enabled his crew to press home attack after attack with the utmost success.

Flt. Lt. W. C. HOLDEN, D.F.C., R.A.F.V.R., No. 138 Sqn.—Since the award of the D.F.C., this officer has completed numerous sorties, the success of which has been largely due to his skill as a navigator. As squadron navigator leader, his enthusiasm and efficiency have been outstanding, and his long operational experience of great value in training new personnel.

Flt. Lt. J. GRIFFITHS, D.F.C., R.A.F.V.R., No. 105 Sqn.—This officer has completed many operational sorties. He is now on his second operational tour, and the results and quality of his work have been outstandingly successful. His skill as a navigator is exceptional.

Flt. Lt. J. HALL, D.F.C., R.A.F.V.R., No. 105 Sqn.—Since being awarded the D.F.C., this officer has completed many more operational sorties. He has maintained his high standard of navigational skill and consistently displayed exemplary courage and devotion to duty.

Flt. Lt. R. A. C. HELLIER, D.F.C., R.A.F.V.R., No. 85 Sqn.—Since the award of the D.F.C., this

SERVICE AVIATION

officer has proved himself on many occasions to be a fearless and courageous captain of aircraft. He has constantly led his crew through the heaviest German defences, achieving the utmost success possible in each sortie. During his first tour of operations he volunteered for an extended period of duty, which he has now fulfilled. His high standard of efficiency and skill have been an example to all in his squadron.

Flt. Lt. R. M. NELSON, D.F.C., R.A.F.V.R., No. 97 Sqn.—Since the award of the D.F.C., Flt. Lt. Nelson has continued to operate with skill, courage and efficiency as air bomber and as squadron bombing leader. He has completed many sorties. His skill and cool directions under heavy fire have always had an inspiring effect on his crew.

Flt. Lt. J. W. WILKINSON, D.F.C., R.A.F.V.R., No. 35 Sqn.—Flt. Lt. Wilkinson has taken part in a large number of operational sorties against some of the enemy's most important and heavily defended areas. An excellent air bomber, he has played no small part in the many successes attained by his crew. Since being awarded the D.F.C., this officer has continued to display a fine fighting spirit and great devotion to duty.

Distinguished Flying Cross

Flt. Lt. F. J. TREVERS, R.A.F.V.R., No. 613 Sqn.
Flt. Lt. A. F. W. VALLE-JONES, R.A.F.V.R., No. 88 Sqn.
Flt. Lt. A. McL. BLACKBURN, R.A.F., No. 84 Sqn.
Flt. Lt. B. D. HANAFIN, R.A.F.V.R., No. 487 (N.Z.) Sqn.
Flt. Lt. P. A. H. MCKEAND, R.A F.V.R., No. 240 Sqn.
F/O. P. G. BREARLEY, R.A.F.V.R., No. 140 Sqn.
F/O. K. F. R. DICKS, R.A.F.V.R., No. 84 Sqn.
F/O. W. S. S. GARNETT, R.A.F.V.R., No. 5 Sqn.
F/O. J. R. HAYNES, R.A.F.V.R., No. 107 Sqn.
F/O. L. R. HEALEY, D.F.M., R.A.F.V.R., No. 277 Sqn.
F/O. K. JONES, R.A.F.V.R., No. 107 Sqn.
F/O. J. S. LANG, R.A.F.V.R., No. 107 Sqn.
F/O. R. LINGARD, R.A.F.V.R., No. 88 Sqn.
F/O. J. E. MATHIAS, R.A.F.V.R., No. 180 Sqn (since deceased).
F/O. J. T. MATTHEWS, R.A.F.V.R., No. 177 Sqn
F/O. G. E. MILLAR, R.A.F.V.R., No. 180 Sqn.
F/O. W. MOFFATT, R.A.F.V.R., No. 140 Sqn.
F/O. R. W. PARR, R.A.F.V.R., No. 20 Sqn.
F/O. D. S. PITKEATHLY, R.A.F.V.R., No. 259 Sqn.
F/O. C. B. M. SHEVLIN, D.F.M., R.A.F.V.R., No. 88 Sqn.
F/O. D. R. THOMPSON, R.A.F.V.R., No. 140 Sqn.
F/O. H. T. WATTON, R.A.F.V.R., No. 93 Sqn.
F/O. I. BELLIS, R.A.F.V.R., No. 21 Sqn.
F/O. G. R. M. POWELL, R.A.F., No. 267 Sqn.
W/O. L. C. HILL, R.A.F.V.R., No. 20 Sqn.
W/O. J. A. JOHNSTON, R.A.F.V.R., No. 684 Sqn.
W/O. T. M. KING, R.A.F.V.R., No. 267 Sqn.
Flt. Lt. E. A. R. ESAU, R.A.A.F., No. 453 Sqn.
Flt. Lt. W. A. MOORE, R.A.A.F., No. 487 (N.Z.) Sqn.
F/O. J. D. STUBBS, R.A.A.F., No. 168 Sqn.
W/O. L. J. MARTIN, R.A.A.F., No. 267 Sqn.
Flt. Lt. A. T. CARLSON, R.C.A.F., No. 400 Sqn.
Flt. Lt. V. J. J. FAUROT, R.C.A.F., No. 226 Sqn.
Flt. Lt. E. W. FOCKLER, R.C.A.F., No. 20 Sqn.
Flt. Lt. J. E. PRITCHARD, R.C.A.F., No. 139 Wing.
Flt. Lt. F. J. SHERLOCK, R.C.A.F.
Flt. Lt. J. C. VAN NES, R.C.A.F., No. 127 Sqn.
Flt. Lt. T. B. WINSLOW, R.C.A.F., No. 268 Sqn.
Flt. Lt. D. H. DOVER, R.C.A.F., No. 405 Sqn.
Flt. Lt. O. M. LINTON, R.C.A.F., No. 401 Sqn
F/O. H. B. DATE, R.C.A.F., No. 20 Sqn.
F/O. N. C. R. HOWE, R.C.A.F., No. 175 Sqn.
F/O. F. S. SORGE, R.C.A.F., No. 602 Sqn.
F/O. J. G. BOOTH, Burma Volunteer Air Force, No. 681 Sqn.
F/O. D. G. BHORE, M.B.E., I.A.F., No. 6 Sqn.
F/O. J. C. VARMA, I.A.F., No. 6 Sqn.
Capt. A. D. MACLEAN, S.A.A.F., No. 81 Sqn.

Distinguished Flying Medal

Flt. Sgt. D. J. CURRIE, R.A.F.V.R., and Sgt. D. E. SOUTH, R.A.F.V.R., both of No. 201 Sqn. For citation see Act. Flt. Lt. Baveystock, D.F.C. and Bar, D.F.M.
Sgt. J. B. SULLIVAN, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Flt. Sgt. C. S. TAYLOR, R.A.F.V.R., No. 295 Sqn.
Flt. Sgt. R. R. ARMSTRONG, R.A.F., No. 408 (R.C.A.F.) Sqn.
Flt. Sgt. J. V. BEVAN, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. S. BROWN, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. R. S. CHILD, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. A. J. DICK, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. N. DIXON, R.A.F.V.R., No. 514 Sqn.
Flt. Sgt. E. R. H. DYDE, R.A.F.V.R., No. 103 Sqn.
Flt. Sgt. C. J. GREEN, R.A F.V.R., No. 635 Sqn.
Flt. Sgt. J. S. LAPLANCHE, A.A.F., No. 77 Sqn.
Flt. Sgt. A. M. MCKIE, R.A.F., No. 106 Sqn.
Flt. Sgt. C. R. BOLT, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. J. MICHAEL, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. BLOWEN, R.A.F.V.R., No. 9 Sqn.
Flt. Sgt. G. H. PAINE, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. R. SOMERSET, R.A.F., No. 166 Sqn.
Flt. Sgt. W. A. SPEARS, R.A.F.V.R., No. 77 Sqn.
Sgt. R. A. NORCROSS, R.A.F.V.R., No. 37 Sqn.
Flt. Sgt. E. S. DOHERTY, R.N.Z.A.F., No. 242 Sqn.
Flt. Sgt. H. J. MILLS, R.N.Z.A.F., No. 53 Sqn.
Flt. Sgt. J. R. TURVEY, R N.Z.A.F., No. 70 Sqn
Act. Flt. Sgt. A. N. JONES, R A F.V.R., No. 83 Sqn.
Act. Flt. Sgt. T. C. MARCHANT, R.A.F.V.R., No. 582 Sqn.
Act. Flt. Sgt. F. WILDMAN, R.A.F.V.R., No. 83 Sqn.
Act. Flt. Sgt. G. W. WRIGHT, R.A.F.V.R., No. 582 Sqn.
Sgt. A. H. ALLISON, R.A.F.V.R., No. 207 Sqn.
Sgt. C. E. BOWYER, R.A.F.V.R., No. 9 Sqn.
Sgt. H. E. CANFIELD, R.A.F.V.R., No. 138 Sqn.
Sgt. J. E. COWAN, R.A.F.V.R., No. 44 Sqn.
Sgt. J. H. DAVIDSON, R.A.F.V.R., No. 44 Sqn.
Sgt. W. DACRE, R.A.F.V.R., No. 61 Sqn.
Sgt. J. W. DUNBAR, R.A.F.V.R., No. 101 Sqn.
Sgt. C. GIDMAN, R.A.F.V.R., No. 207 Sqn.
Sgt. D. GROSCOP, R.A.F.V.R., No. 50 Sqn.
Sgt. H. G. HALL, R.A.F.V.R., No. 207 Sqn.
Sgt. C. A. HORN, R.A.F.V.R., No. 50 Sqn.
Sgt. E. F. MARTIN, R.A.F.V.R., No. 463 (R.A.A.F.) Sqn.
Sgt. J. MICHIE, R.A.F.V.R., No. 44 Sqn.
Sgt. H. L. ROBERTS, R.A.F.V.R., No. 44 Sqn.
Sgt. J. A. RUSSELL, R.A.F.V.R., No. 576 Sqn.
Sgt. R. O. SMITH, R.A.F.V.R., No. 9 Sqn.
Sgt. B. WOODWARDS, R.A.F.V.R., No. 44 Sqn.
Sgt. E. C. WREN, R.A.F.V.R., No. 44 Sqn.
Sgt. W. H. A. YOUNG, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. W. E. MILLER, R.A.A.F., No. 9 Sqn.
Flt. Sgt. W. H. R. CHAMPION, R.C.A.F., No. 44 Sqn.
Flt. Sgt. D. MCK. MURRAY, R.C.A.F., No. 44 Sqn.
Flt. Sgt. D. D. SALMON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Flt. Sgt. W. R. I. MARONEY, R.A.F.V.R., No 550 Sqn.
Flt. Sgt. A. G. PAGE, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. J. C. K. PLATTS, R.A.F., No. 582 Sqn
Flt. Sgt. J. A. PEAKER, R.A.F.V.R., No. 49 Sqn.
Flt. Sgt. G. J. SCUFFINS, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. R. A. SNOWDON, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. J. WRIGLEY, R.A.F.V.R., No. 635 Sqn.

Flt. Lt. L. H. Baveystock, D.F.C., D.F.M., who has been awarded a Bar to his D.F.C. The official citation appears on page 352.

Flt. Sgt. T. AITKEN, R.A.F.V.R., No. 619 Sqn.
Flt. Sgt. N. F. BACON, R.A.F.V.R., No. 80 Sqn.
Flt. Sgt. J. C. BARBER, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. W. R. BEDFORD, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. C. BILLINGTON, R A F.V.R., No. 75 (N.Z.) Sqn.
Flt. Sgt. T. W. BLAIN, R.A.F.V.R., No. 158 Sqn.
Flt. Sgt. D. BOLLAND, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. R. J. BOWEN, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. A. J. Z. CADEY, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. D. P. CANNINGS, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. G. K. CHAPMAN, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. F. COOPER, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. T. E. CURRAN, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. D. A. DEAR, R.A.F.V.R., No. 207 Sqn.
Flt. Sgt. R. ELLAWAY, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. J. R. ESPLEY, R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. T. FLEETWOOD, R.A.F.V.R., No. 619 Sqn.
Flt. Sgt. A. GARCIA, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. M. J. GIBBONS, R.A.F.V.R., No. 138 Sqn.
Flt. Sgt. G. W. GRACEY, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. J. F. HALL, R.A.F.V.R., No. 429 Sqn.
Flt. Sgt. J. HAY, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. L. HOWARTH, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. W. HUME, R.A.F.V.R., No. 617 Sqn.
Flt. Sgt. W. J. HYNDMAN, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. J. W. LATHAM, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. R. R. LONG, R.A.F.V.R., No. 35 Sqn.

THE KING has been graciously pleased to approve the following awards:—

M.B.E. (Mil.)

Sister Miss V. K. STONE, Princess Mary's R.A.F. Nursing Service.—One night in April, 1944, Sister Stone was in her quarters when a Halifax aircraft crashed through three huts in which W.A.A.F. personnel were billeted. Although she had completed twelve hours' continuous duty, Sister Stone was soon at the scene of the accident where she immediately took control of the situation and undoubtedly quelled what might have been a serious panic. Small fires from lighted stoves began to spring up but in spite of these and the risk of falling debris, and ignoring the fact that the aircraft was lying beside one of the huts, Sister Stone extricated many of the wounded and administered aid to those in distress. Although the aircraft carried only smoke bombs this was not known at the time. After the arrival of the medical officers, Sister Stone went immediately to the operating theatre where she spent the rest of the night attending to the wounded; she reported for her normal duties at eight the next morning. She displayed great efficiency and devotion to duty.

W/O.1 A. C. M. COATS, S.A.A.F., No. 12 (S.A.A.F.) Sqn.—One day in April, 1944, during the loading of bombs into aircraft which were being prepared for an operational flight, one of the fully laden bombers exploded and was destroyed. Fire broke out and spread to an adjacent petrol dump. The blazing petrol endangered a dump of fragmentation bombs and most serious consequences would have followed if the refuelling bowsers in the vicinity had caught fire. A second aircraft, with its full bomb load, also caught fire and, after blazing fiercely exploded at about 13.45 hours. The officers and airmen rushed to the scene on hearing the first explosion. Although warned that the second aircraft was liable to explode at any moment, Lt. Brown and Flt. Sgt. Du Preez went forward and carried a seriously injured airman to safety. Following this they returned and each drove away a petrol bowser just before the second explosion. Having summoned medical aid, W/O. Coats climbed into a refuelling bowser and drove it to a safe distance. He then returned and was removing bombs from the aircraft dispersal area when the second explosion occurred, causing injuries which necessitated his removal to hospital. Flt. Sgt. Templeman tried unsuccessfully to start up the engine of a petrol bowser and then drove to safety a three-ton truck which had been parked between the petrol and bomb dumps. He afterwards returned and was rolling petrol drums to safety when the second explosion took place and he was removed to hospital on account of injuries sustained. Sgt. Mitchell searched for injured persons in the blazing wreckage and then assisted in removing explosive equipment from the area of the conflagration. The personnel concerned in this incident showed great courage and initiative and acted with entire disregard of personal safety.

Distinguished Service Cross

F/O. J. ROGERS, R.A.F.V.R.—On March 8th, 1944, F/O. Rogers and Cpl. Parham were commanding officer and coxswain respectively of a high-speed launch which was directed to the rescue of the crew of an aircraft which had been damaged by enemy fire in a position some seven miles off the coast of Elba Island. In spite of intense and accurate bombardment from the shore the launch was manœuvred towards the three members of the aircraft's crew who had taken to their dinghy. They were rescued and taken safely back to Corsica. Throughout the operation, which lasted half an hour, while shells were falling within 20 feet of the launch, this officer and airman remained cool and determined to achieve their task. In so doing they displayed great courage and fine seamanship. F/O. Rogers has previously completed many successful rescue sorties in other waters.

Air Force Cross

Flt. Lt. C. A. CHEW, R.A.F.V.R.—In June, 1944, Flt. Lt. Chew was captain of an aircraft engaged on an instructional flight by night. Four circuits and landings were completed, but, while the aircraft was taking off for the fifth time, a serious defect occurred in the starboard engine. Flt. Lt. Chew at once took over control from the pupil pilot and managed to reach an altitude of 800 feet. This was accomplished with the greatest difficulty, as the port engine only was functioning. Excessive vibration made the aircraft difficult to control, and it was found impossible to maintain height. As the aircraft descended, the starboard engine caught fire and the airscrew fell off. The undercarriage mechanism was unserviceable. In this precarious situation Flt. Lt. Chew determined to land on the runway in order to avoid crashing into other aircraft. With outstanding skill and coolness, he landed the crippled and burning aircraft in the middle of the runway. The body of the aircraft was blazing by this time, and only the extreme promptitude and presence of mind displayed by the instructor enabled the whole crew to jump clear without injury. This officer completed a tour of operational duty with Fighter Command during the Battle of Britain.

Act. Flt. Lt. L. O. WILLIAMS, R.A.A.F.—On December 31st, 1943, Flt. Lt. Williams was testing a Master Aircraft with an airman as his passenger when the aircraft caught fire at 3,500 feet. Although practically overcome by fumes, smoke and the intense heat in the cockpit, Flt. Lt. Williams kept the aircraft under control, maintaining straight and level flight at a low air speed, thus enabling his passenger to leave the aircraft by parachute. Then, when the flames

SERVICE AVIATION

had partially subsided, he successfully accomplished a landing down-wind on the airfield. The fire in the aircraft was finally extinguished by the crew of the fire tender. Throughout his trying experience, in which he disregarded his own safety in preference to that of his passenger, this officer displayed praiseworthy coolness, skill and courage.

George Medal

Lt. A. D. BROWN, S.A.A.F., No. 12 (S.A.A.F.) Sqn., and Flt. Sgt. W. DU PREEZ, S.A.A.F., No. 223 Sqn.—For citation see W/O. I. Coats, M.B.E.

Flt. Lt. W. E. SPEIRS, R.A.F.V.R.—In March, 1944, a party of airmen was fusing 500lb. bombs. One or more of the bombs exploded, causing a number of casualties (three of which were fatal) and rendering a large number of the remaining bombs dangerous. Flt. Lt. Speirs, the Wing Armament Officer, was near the fusing area and had been severely shaken by blast, but he immediately rushed to the scene and helped an injured man to safety. He then commenced to disperse the remaining bombs, although he knew that some of them might detonate at any moment. Having dispersed them he proceeded to make a detailed examination of each of the suspected bombs, and, on his advice, the dump was declared closed for 24 hours. After this lapse of time Flt. Lt. Speirs again examined each bomb and recommended the further closure of the dump. Six hours later four more bombs exploded, and during the following 24 hours other bombs detonated. It then became essential to examine the remaining bombs as the woods in their vicinity were burning furiously. Flt. Lt. Speirs undertook this examination, and, as a result, an area was declared safe and the fire in the woods was dealt with, thereby saving a considerable number of trees from destruction. After a further period of waiting, this officer again examined all bombs in the area, and on his decision that they were sufficiently safe, he supervised their demolition. Thirty bombs were rendered innocuous. This officer displayed high courage and leadership throughout.

L.A/C. J. MCK. MCCABE, R.A.F.V.R., and L.A/C. L. M. WILLIAMS, R.A.F., both of No. 73 Sqn.—One evening in February, 1944, these airmen displayed exceptional courage and devotion to duty when an aircraft, carrying a full bomb load, crashed and caught fire. L.A/C. Williams, who was nearby, was one of the first to arrive at the scene of the accident and, in spite of exploding ammunition and the danger of the bombs exploding, he succeeded in rescuing the rear gunner. Then, with the assistance of two others, he proceeded to take the gunner to safety; the first bomb exploded when they were only 50 yards away. L.A/C. McCabe, a nursing orderly, arrived in the ambulance within four minutes of the aircraft crashing. The first bomb had exploded and, although fully aware that others were likely to detonate any moment, he continued to the aircraft and located a member of the crew who was, unfortunately, dead. L.A/C. McCabe helped to remove the body to a place of safety. When only 30 yards away from the aircraft a second bomb exploded, and no further rescues could be effected. Those airmen displayed high courage and complete disregard of their personal safety.

Distinguished Service Medal

Cpl. E. R. PARHAM, R.A.F.V.R.—For citation see F/O. RODGERS, D.S.C.

B.E.M. (Mil.)

Flt. Sgt. A. J. TEMPLEMAN, S.A.A.F., and Act. Sgt. J. R. MITCHELL, S.A.A.F., both of No. 12 (S.A.A.F.) Sqn.—For citation see W/O. I. Coats, M.B.E.

Cpl. G. GREENWOOD, R.A.F.V.R.

Sgt. J. N. RUMSBY, R.A.F.V.R.—One night in March, 1944, Sgt. Rumsby was a member of the crew of a Wellington aircraft which crashed through a tree on to a barn and proceeded through the top storey of a farm building, finally resting on the roof of another building containing live stock. The tangled wreckage burst into flames. Sgt. Rumsby, although badly bruised and shaken, managed to extricate himself from the wreckage and fell off the roof of the building into the midst of many pedigree bullocks in a stall below. After releasing the animals, who were wild with fear, Sgt. Rumsby climbed back on the roof to search for his companions. He found the pilot of the aircraft injured and with his clothes on fire. Sgt. Rumsby put out the flames and assisted the pilot from the roof and to the farmhouse. He then returned to the blazing wreckage and made a further search, disregarding the danger from the explosion of fuel tanks in the aircraft and the collapse of the roof of the building. He displayed great gallantry and undoubtedly saved the life of his pilot.

Fleet Air Arm

THE KING has been graciously pleased to approve the following award:—

For undaunted courage, skill and determination in the daring attack on the German Battleship *Tirpitz* on April 3rd, 1944:—

Distinguished Service Medal

Ldg. Airman, Telegraphist, Air Gunner E. CARROLL.

Roll of Honour

Casualty Communiqué No. 427.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 99 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. L. G. Ambler; P/O. S. Blackburn; Sgt. F. Curry; W/O. G. Davies; F/O. J. E. Davies; Flt. Sgt. A. F. Gardner; W/O. E. A. Hutton; Sgt. O. W. Kirk; Flt. Lt. M. A. McGilligan; F/O. A. E. Norris; F/O. H. C. Tessier; Flt. Sgt. L. Wilson; F/O. T. D. Young.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. H. N. Davis; Flt. Sgt. H. T. French; P/O. V. Lower; P/O. C. H. Spiers; Flt. Sgt. D. A. Webster; Sgt. G. White.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O F. N. Alexander, D.F.M.; Sgt. J. H. Anderton; Sgt. B. Bishop; Sgt. A. R. Bohn; Sgt. E. R. Boreham; Sgt. B. S. Burch; F/O. R. E. H. Burton; Sgt. L. Cotton; Sgt. G. D. Cox; P/O. W. J. Coyle; Sgt. S. Cugley; P/O. G. Davies; Flt. Sgt. B. Donigan; Sgt. H. Entwistle; Flt. Lt. R. W. Ferguson; Act. Flt. Lt. S. C. P. Godfrey; Sgt. T. Grange; Sgt. W. H. Greaves; Act. Flt. Sgt. M. Haslegrave; Sgt. J. R. Henderson; Flt. Sgt. S. Hitchen; P/O. R. M. Hogg; P/O. J. B. Hurst; Sgt. H. J. W. Hynds; W/O. P. J. Jennings; Sgt. R. Large; F/O. D. G. Leader-Williams; W/O. J. F. Little; Flt. Sgt. R. B. S. Lulham; Sgt. J. McGuirk; Flt. Sgt. W. B. MacKinley; Act. Flt. Lt. C. B. T. McSweeney; Flt. Lt. D. C. Maltby; Act. Flt. Lt. A. J. M. Milne, D.F.C.; Flt. Sgt. P. Moore; Sgt. K. R. Norie; Sgt. W. A. Mudge; W/O. W. T. Saunders; Flt. Sgt. N. L. Sherwood; Flt. Sgt. F. Shuttleworth; Sgt. E. J. Smyth; F/O. A. W. Stringer; Sgt. E. E. Strong; Sgt. T. D. G. Teare; Sgt. H. J. Thomas; Sgt. S. G. Warke; Sqn. Ldr. R. G. Watson; Flt. Sgt. J. F. Wheatley; Sgt. J. D. Whittingham; Sgt. D. L. Wilkie, D.F.M.; P/O. T. R. Wilson; Sgt. J. Wright.

WOUNDED OR INJURED IN ACTION.—L.A/C. L. T. Mason; Flt. Lt. D. J. Thrift; Flt. Sgt. G. W. Wright.

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. Bates; Sgt. G. H. Butler; Flt. Sgt. E. H. Calvert; Flt. Sgt. D. C. Dick; Sgt. R. J. Evans; Sgt. W. A. Gosnay; P/O. M. Henderson; Sgt. A. Johnson; Sgt. D. J. Jones; Sgt. W. D. Kirton; Sgt. W. McCulloch; F/O. W. G. Philpot; Sgt. K. J. Power; F/O. W. J. Rogers; F/O. R. W. Wilkins; Flt. Sgt. J. Williams.

MISSING.—P/O. T. A. Allen; Sgt. G. J. J. Ashpole; Flt. Sgt. J. Bailey; Flt. Sgt. R. Barnes; Sgt. D. R. Bell; Sgt. J. E. Benson; Sgt. C. A. Bonner; Sgt. A. H. Brown; Sgt. W. S. Campbell; Sgt. W. J. Christie; Sgt. J. Clarke; Flt. Sgt. W. A. Clevey; Flt. Sgt. K. S. Collins; P/O. L. Collins; Sgt. D. Davies; Sgt. W. Davis; Sgt. K. H. F. De Lengerke; Sgt. R. A. Drury; Sgt. T. A. Eburne; Sgt. R. Edwards; Sgt. H. J. Evans; Act. Flt. Lt. C. C. Fox, D.F.M.; F/O G. H. Godsell; L.A/C. E. J. Graves; Sgt. A. G. Hall; Flt. Sgt. R. E. Hardwick; Sgt. S. Haslett; Sgt P. C. Heal; Flt. Sgt. J. Henderson; P/O. P. Hicken; Sgt. J. Hoarty; W/O. G. C. C. Holmes; Sgt. R. Holmes; Sgt. N. Hornby; F/O. P. M. Hughes; F/O. J. D. Hurley; P/O. K. H. Jackson; Sgt. P. J. Jeffs; Sgt. J. I. Jolley; P/O. K. I. Kernahan; Sgt. P. C. M. King; F/O. K. J. Lambert, D.F.C.; Sgt. R. Lethbridge; Flt. Lt. R. N. P. Luff; Sgt. T. F. McClay; Sgt. J. P. McEvoy; Flt. Sgt. J. McFarlane; F/O. E. E. MacKay; W/O. F. A. Mander; F/O. N. A. Marston, D.F.C.; Sgt. H. J. Mather; P/O. W. H. Mayo; Sgt. H. A. Messenger; Sgt. B. R. Morgan; Sgt. N. E. Mullins; Sgt. F. C. Mustoe; Flt. Sgt. V. L. J. Newell; F/O. R. J. Newens; Sqn. Ldr. L. Ollier, D.F.C., A.F.M.; Flt. Sgt. R. Parker; Flt. Lt. T. Rawlinson; Sgt. J. Ray; Act. Sqn. Ldr. R. Reavill; Sgt. G. Reid; Sgt. T. H. Riley; Sgt. W. M. Rivers; Sgt. B. J. Roach; P/O. J. M. Roberts; Sgt. R. Rook; Flt. Sgt. W. S. Rowan; Sgt. M. Rume; Sgt. H. Russell; F/O. G. H. Scott; W/O. H. Shaw; Sgt. J. L. Sheahan; Sgt. J. Shields; Sgt. A. N. Smith; F/O. C. A. Smith, D.F.M.; Sgt. T. H. J. Smith; Sgt. R. E. Stubbs, Flt. Sgt. W. A. Sullock; Sgt. R. T. Taylor; Sgt J. M. Thomas; Sgt. N. Thompson; Flt. Sgt. T. W. Thompson; Sgt. H. G. Trump; Sgt. M. J. H. Vedovato; Sgt. N. P. Warlow; Sgt. J. Welsh; F/O. B. A. White; Sgt. W. J. White; F/O G. A. Wilkinson; F/O. F. Williams, D.F.M.; P/O. E. B. Wilson; Sgt. R. Wynne-Cole.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. J. Alston; L.A/C. W. M. Finch; A/C.1 D. Harris; Flt. Lt. W. D. Ingram; F/O. J. MacGregor; F/O. H. E. Montagnon; Cpl. F. T. Onley; Sgt. L. J. Pearce; Sgt. F. W. Reed; F/O. A. F. Richardson; F/O. D. Stevens.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. D. Cockerill; F/O. S. J. Dudley; Sgt. L. Hockey; Sgt. J. Toyne; Sgt. E. Vose.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Cpl. J. Gilgallon; L.A/C. G. H. C. Smith; L.A/C. J. F. Wright.

DIED ON ACTIVE SERVICE.—L.A/C. A. F. Allen; A/C.1 H. Catterall; L.A/C. H. Franklin; L.A/C. E. W. King; Flt. Lt. H. E. J. B. Northcott; L.A/C. S. R. Turner; L.A/C. G. C. Wheeler.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. B. A. Lee; Sgt. E. A. Hughes; Act. Sqn. Ldr. W. W. McConnell, D.F.C.; Flt. Sgt. N. J. Shergold.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 B. M. Taylor.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. A. R. Gale.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. E. Deverell; Flt. Sgt. C. R. Gordon; Sgt. W. H. McDonald.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. I. W. Bowen; F/O. G. J. Bushell; Flt. Sgt. G. R. Clark; F/O. C. R. Croft; Sgt. J. G. Dwyer; P/O J. J. Fletcher; W/O. R. M. Goode; Flt. Sgt. J. W. Hallas; Flt. Sgt. G. W. Harnett; P/O. J. D. Hocking; Flt. Sgt. T. J. Jones; Flt. Sgt. R. S. Kift; Flt. Sgt. C. D. L. Longson; F/O. J. D. MacKay; Flt. Sgt. G. V. McMurray; Sgt. W. E. G. Matthews; W/O. J. H. H. Owen; Act. Flt. Lt. K. MacD. Simpson, D.F.C.; F/O. H. F. Symons; Flt. Sgt. R. J. Taylor; Flt. Sgt. P. K. Turner.

MISSING.—Flt. Sgt. J. O. Harris; Flt. Sgt. F. R. Hughes; Flt. Sgt. O. P. McFadden; P/O. H. F. Munday; Flt. Sgt. F. R. Sweeney.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. G. F.

U.S. ROYALTY: A three-quarter front view of the new Bell Kingcobra showing the streamlined air-intakes under the wings. These intakes are in the wings on the Airacobra.

TACTICAL TALK: Marshal of R.A.F. Sir Charles Portal and Air Vice-Marshal W. Elliott talking to Wing. Cdr. J. E. Proctor during Sir Charles' tour of two Tactical Wings of the Balkan Air Force based in Italy.

Brown; P/O. A. R. Duel; W/O. H. J. Fletcher; P/O. R. L. Francis; Flt. Sgt. K. W. Hennessy; Flt. Sgt. G. B. McSweeney; F/O. W. E. L. Moody; F/O. M. J. Mott; Flt. Sgt. W. R. R. Porter; Flt. Sgt. P. S. Sullivan; W/O. B. L. Ulrick.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. S. J. Ricketts, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. D. K. Milne; P/O. J. Stanley.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. M. C. Murray.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. F. Christie; Wing Cdr. D. S. Jacobs, D.F.C.; Flt. Lt. T. R. McDougall, D.F.C.; F/O. D. N. McKenzie; F/O. P. Nazar; P/O. J. L. Michell; P/O. W. McG. Stewart; P/O. D. E. Tate; F/O. E. A. T. Taylor, D.F.C.

MISSING.—Sgt. J. N. Almond; F/O. J. K. Anderson; Flt. Sgt. E. L. Bailey; Flt. Sgt. J. W. Barber; Sgt. S. P. Beech; Sqn. Ldr. G. Bennett, D.F.C.; P/O. J. F. Brown; P/O. J. R. H. Cochrane; Sgt. P. E. Coltman; F/O. J. B. Dallyn; F/O. K. H. Davies; P/O. F. G. Devereaux; P/O. F. W. Dolter; W/O. B. Dunlop; F/O. R. A. Faulafer; P/O. M. A. Fernandez de Leon; Flt. Sgt. T. E. Flanagan; F/O. R. D. Ford; W/O. J. H. Frame; W/O. J. Friedt; F/O. J. Gouinlock; Flt. Sgt. S. W. Hans; Flt. Lt. J. R. Hanson, D.F.C.; Sgt. J. Hooks; Sgt. N. E. Hyt; W/O. J. Kellie; P/O. G. P. J. Kimmins; Sgt. L. Kirton; F/O. G. R. Lauder; P/O. W. C. Lawson; P/O. F. G. Lebano; Flt. Sgt. J. T. L. Leblanc; Sgt. W. D. Lillico; P/O. D. McCrae; P/O. W. R. McCutcheon; P/O. J. L. MacDonald; W/O. A. C. MacGillivray; F/O. W. G. McKay; P/O. H. J. Menzies; F/O. L. E. Morgan; P/O. A. J. Murphy; Sgt. J. A. W. Nind; W/O. G. J. Overend; Sgt. K. L. Patience; F/O. S. G. Peterson; P/O. E. C. Purney; F/O. M. Rabovsky; Flt. Sgt. E. J. Richardson; F/O. D. M. Robson; W/O. H. H. Rodgers; W/O. J. A. Rooney; P/O. C. V. Ross; F/O. D. E. Rutherford; W/O. F. P. Sabine; F/O. G. E. Scott; F/O. M. Shapiro; Sgt. S. L. Silver; Flt. Lt. G. A. Smith; Flt. Sgt. P. S. Smith; P/O. N. D. L. Stephenson; Sgt. C. D. Stroud; W/O. G. A. Wilson; Sgt. H. K. Wilson; Flt. Sgt. N. A. Wilson; W/O. J. P. Young.

KILLED ON ACTIVE SERVICE.—F/O. W. D. N. McKessock.

DIED ON ACTIVE SERVICE.—Sgt. P. K. Matkin; F/O. H. Ratner.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. A. A. Johnson; Flt. Sgt. R. A. Johnson; F/O. N. R. Maxwell.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. R. Harder; Flt. Sgt. A. H. Holms.

South African Air Force

DIED ON ACTIVE SERVICE.—Air Sgt. C. L. K. Scally.

Casualty Communiqué No. 428

Of the names in this list 99 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. R. V. Allen; Flt. Lt. D. Boyle; Sgt. T. H. Clark; F/O. J. Cruickshank; F/O. P. E. Dickinson; Sgt. T. H. Edwards; F/O. H. R. Keen; Flt. Sgt. C. L. Kershaw; Flt. Sgt. C. E. Lang; W/O. N. B. Langton; Flt. Sgt. W. J. McDonald; Flt. Sgt. E. G. McNeal; Sgt. R. W. Pole; Sgt. S. L. Squire; Sgt. S. J. Trusson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. V. J. Barnes; P/O. W. J. Champion; P/O. V. J. Chorley; Sgt. P. Crosland; F/O. L. Healey; P/O. S. R. Hughes; Flt. Sgt. H. Lidgett; F/O. W. H. McDowell; F/O. J. W. Payne; F/O. A. B. Potts; Flt. Sgt. S. A. Richardson; P/O. C. F. Smith; Flt. Sgt. J. S. Whitecross.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. J. T. Anderson; Sgt. W. S. Backway; F/O. C. J. Barber; Sgt. G. H. McD. Batten; Sgt. J. M. Bliss; Sgt. R. D. Botting; P/O. P. L. Bowden; Sgt. R. S. Bowers; Sgt. T. W. Bradford; Flt. Sgt. A. A. Brown; Sgt. E. O. Bryant; P/O. P. E. Camille; Sgt. H. Cartwright; Sgt. H. Chambers; Sgt. K. W. Chaplin; Flt. Sgt. J. W. Childs; Sgt. R. A. Chorley; F/O. R. C. S. Clements; Sgt. J. J. Close; Sgt. E. Colbert; Sgt. T. J. Colston; Sgt. D. G. Connor; F/O. J. Coulthard; Flt. Sgt. F. Cowie; Sgt. H. Cox; F/O. P. Crozier; Sgt. D. Curry; Sgt. F. A. Dalton; Sgt. D. E. Davies; Sgt. W. H. Dickinson; Sgt. C. R. Edwards; Sgt. G. L. Gard; Sgt. E. A. Gibbs; Flt. Sgt. W. Goldsbrough; Sgt. D. A. P. Guest; Sgt. J. Hall; Flt. Sgt. D. L. W. Horn; Flt. Sgt. E. Hornby; F/O. J. D. Hotson; Flt. Sgt. A. Hughes; Sgt. C. L. Kingsnorth; Act. Flt. Sgt. R. A. Knight; F/O. D. H. McLaughlan; Sgt. J. McLean; Sgt. W. J. B. McNaught; Sgt. J. B. Malcolm; Sgt. C. L. Manuel; Sgt. R. F. Matthews; Flt. Sgt. T. D. Mayne; P/O. D. Miller; Sgt. R. G. Nelson; Sgt. H. D. Newey; Sgt. J. W. Noble; Sgt. G. L. Odgers; Flt. Sgt. T. H. Payne; Sgt. D. E. Potts; Sgt. H. Priestley; Flt. Sgt. C. Salisbury; Sgt. F. E. Skinner; F/O. P. A. Stevens; Sgt. G. R. Thomas; Sgt. K. W. Walker; Sgt. J. J. Waterman; Sgt. R. A. Waters; Sgt. T. Whatley; F/O. R. P. Wissler; Sgt. A. L. York.

MISSING, BELIEVED KILLED IN ACTION.—P/O. A. J. McD. Barr; F/O. W. P. Brittain; Sqn. Ldr. P. R. A. Ford, D.F.C.; Flt. Lt. J. B. L. Jones; P/O. G. Lister; Flt. Sgt. R. A. Newham; Sgt. J. H. Rudge.

MISSING.—W/O. R. B. Aitken; Act. W/O. R. J. Andrews; Flt. Sgt. R. C. Bailey; Flt. Sgt. T. Bamford; Flt. Sgt. L. J. Barnes; F/O. K. Bateman; Sgt. J. Bender; Flt. Sgt. F. M. Bennett; F/O. H. Blenkinsop; Sgt. F. Bowman; Sgt. B. E. Bridger; Sgt. R. Brown; Flt. Sgt. A. G. Bryant; Act. Flt. Sgt. R. G. Burton; Sgt. J. B. Carr; F/O. K. W. Chapman; Sgt. W. J. Cheshire; Flt. Sgt. G. E. Clover; Flt. Sgt. A. Collins; P/O. D. P. Coltart; Act. Flt. Lt. N. J. Cornell; Sgt. F. W. Cousins; Sgt. J. Cunningham; P/O. G. A. J. Curtis; Sgt. L. O. Daniels; Flt. Sgt. D. T. Davidson; Act. Sqn. Ldr. I. J. Davies, D.F.C.; Flt. Lt. R. R. Densham; Flt. Sgt. H. C. Dent; Sgt. N. H. Dew; Sgt. A. R. Docker; Sgt. D. W. Drummond; Sgt. R. E. Duck; F/O. T. W. Dunk; Flt. Sgt. T. L. Eastham; F/O. H. W. Ellis; F/O. C. J. Ennis, D.F.C.; Flt. Sgt. E. V. Evans; Flt. Sgt. G. J. H. Fairs; Flt. Sgt. D. Flett; Sgt. R. E. Foulds; F/O. L. H. J. George, D.F.C.; Sgt. J. E. Girdwood; P/O. E. A. Goodman; F/O. K. W. Gray; P/O. J. E. Hall; Sgt. J. W. Hampson; Act. Sqn. Ldr. R. L. Hanbury; Flt. Sgt. F. J. Harrington; F/O. D. A. Harwood; Flt. Sgt. T. W. Hill; F/O. C. L. Hodsman; Sgt. I. L. Horler; Sgt. D. A. Houben; Flt. Sgt. H. E. Houldsworth; Flt. Sgt. G. Hughes; Sgt. J. R. Ireland; Sgt. B. W. Jarvis; P/O. P. Johnson; Sgt. C. E. Judge; Flt. Sgt. D. R. Kelly; Sgt. H. G. Kember; Sgt. J. K. Kimberley; Sgt. W. D. Knight; Sgt. G. Lackie; Sgt. J. W. Lane; Sgt. J. V. Lea; Sgt. J. H. McGlade; Act. Flt. Lt. J. Marpole; F/O. H. H. Marsh; Flt. Lt. J. L. Martin; F/O. J. H. Mills; Sgt. H. D. Mitchell; Sgt. F. Morgan; Sgt. H. L. Morgan; Sgt. F. Morton; Sgt. A. G. E. Mount; Sgt. A. C. Noble; F/O. W. Ogston; Flt. Sgt. R. Osbourne; Sgt. R. Parkin; F/O. H. F. Peacock; Sgt. A. Pearson; Sgt. J. D. H. Pierce; Sgt. I. A. Place; Sgt. H. W. V. Quelch; Sgt. E. E. W. Raddan; Sgt. W. T. Reaveley; Sgt. A. Rowe; F/O. F. G. Rudduck; Flt. Lt. B. E. Scott; Sgt. V. F. Scrivens; Flt. Sgt. J. P. Shaw; Sgt. H. E. W. Simpson; Sgt. F. N. Smith; P/O. J. H. G. Smith; Sgt. R. Stallwood; F/O. S. J. Stott; F/O. A. R. Tarlton; Flt. Sgt. C. R. Taylor; Sgt. W. Teape; Sgt. A. E. Till; Flt. Sgt. J. Vaughton; Sgt. H. J. Wakeford; Act. Flt. Lt. R. A. Walker; Act. Flt. Lt. J. H. Wells; Sgt. T. J. Whiteside; Flt. Sgt. H. N. C. Whitmore; F/O. N. B. Wilcock; F/O. D. Wilson; Sgt. E. S. Worden; Sgt. G. B. Wright; Flt. Sgt. L. Wright; Sgt. W. I. Williams.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. G. A. Bennett; F/O. J. B. Knight; F/O. P. Waite.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. J. L. Deans, D.F.C.; Act. Flt. Lt. J. G. Griffith; Sgt. T. McDonnell; F/O. D. M. Nedahl.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. A. P. N. Chopping.

DIED ON ACTIVE SERVICE.—Flt. Lt. A. A. Ballantine; Sgt. E. J. Brant; Cpl. J. W. Cliff; Flt. Sgt. T. Cooper; Cpl. C. W. Orane; L.A/C. S. Holden; Cpl. G. H. Searby; L.A/C. F. Yaw.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. G. R. Crawford.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. F. F. Innes; Flt. Sgt. S. C. Kitchen; Sgt. R. D. C. Smith.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Act. Flt. Lt. J. A. Hamlet.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. A. M. Duggleby; F/O. W. Kirk.

MISSING.—Flt. Sgt. L. M. G. Baker; Flt. Lt. L. R. Brine; F/O. R. H. Buchan-Hepburn; Flt. Sgt. C. Clements; Flt. Sgt. D. G. Cranston; Flt. Sgt. N. E. Dickenson; Flt. Sgt. H. J. Earl; P/O. B. W. Giddings; Flt. Sgt. B. A. Hands; Flt. Sgt. P. W. Hogan; Flt. Sgt. A. A. Kennedy; Act. Flt. Lt. T. W. Kennedy; Flt. Sgt. V. D. Luton; Flt. Sgt. D. K. McDonnell; F/O. J. A. D. McGill; P/O. J. M. Mayhead; Flt. Sgt. S. J. Saligari; Act. Flt. Lt. R. H. Samson; Flt. Sgt. W. J. Scale; Flt. Sgt. J. G. Stewart; Flt. Sgt. B. J. Sutton; P/O. J. E. Todd; W/O. W. B. Webb; Flt. Sgt. J. D. Whitby; W/O. J. E. Woodey.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. W. Marshall.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. R. C. Webb.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. G. B. Coombes.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. P. E. R. Baillargeon; F/O. J. F. T. Beesley; Sgt. R. F. Carol; Sgt. G. W. Durnin; Sgt. M. S. Forsberg; F/O. R. R. Irvine; Flt. Sgt. V. A. McLellan; F/O. R. H. Tranter.

WOUNDED OR INJURED IN ACTION.—W/O. P. F. Branch; Sgt. J. B. Sullivan.

MISSING, BELIEVED KILLED IN ACTION.—F/O. A. G. Smith; Flt. Sgt. J. K. Stenhouse; Sgt. G. F. Vinett.

MISSING.—P/O. A. L. Arnell; P/O. J. P. Artyniuk; F/O. H. D. Bastable; F/O. R. A. Bromley; Sgt. J. J. B. Cardinal; Sgt. E. W. B. Carlson; F/O. J. S. Cox; F/O. L. F. Curry; F/O. P. J. Gandy; P/O. I. MacK. Hamilton; F/O. J. W. Hermiston; F/O. H. R. Jones; P/O. G. B. Jose; W/O. A. C. Lornson; W/O. L. W. Love; P/O. A. D. MacKay; Flt. Lt. J. A. MacKelvie; Flt. Lt. R. B. Moore; F/O. H. A. Morrison; P/O. W. D. Mullin; F/O. N. G. Nahu; Flt. Sgt. G. L. Nordbye; P/O. D. M. Norris; F/O. D. B. Norton; F/O. L. Parent; F/O. L. Perez-Gomez; Flt Lt. R. Powdrill; Flt. Lt. H. Russel; Sgt. D. W. Sammon; P/O. B. C. Scobie; P/O. R. M. Smith; Sgt. G. S. Tanuck; F/O. F. G. Tilt; Sgt. J. F. E. Yates.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. J. Martin; F/O. H. D. Stephens.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. R. W. Clark-Hall.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. S. Calder; Sgt. N. E. Cundy; Flt. Sgt. W. T. Dobson.

MISSING, BELIEVED KILLED IN ACTION.—F/O. F. W. MacD. Stout.

MISSING.—P/O. I. L. Bonisch; F/O. B. Cowie;

GERMAN AIR-CRAFTINESS: A dummy Heinkel III found on a French airfield. It is made from old French aircraft with plywood additions. As seen from even a low altitude, it appeared to be realistic.

SERVICE AVIATION

Flt. Sgt. T. R. Donaghy; Act. Sqn. Ldr. P. J. Lamason, D.F.C.; Flt. Sgt. J. M. T. McKenzie; Flt. Sgt. J. S. Miller.

KILLED ON ACTIVE SERVICE.—Act. Sqn. Ldr. J. G. McK. Grant.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—W/O. D. K. Cotterill.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. R. G. Fenton.

South African Air Force

KILLED IN ACTION.—Capt. I. N. L. Taylor, D.F.C.

MISSING, BELIEVED KILLED IN ACTION.—Lt. J. D. N. Harding.

MISSING.—Lt. R. B. McKechnie; Lt. B. D. Shelver; Lt. A. Steward.

Casualty Communiqué No. 429

Of the names in this list 71 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. J. D. E. Davies; F/O. F. D. R. Hildrew; F/O. H. G. Holtrop; Sgt. E. T. Lascelles; F/O. S. Payne; P/O. C. S. Warming.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. Coulson; Sgt. D. Hydes; Sgt. T. Rawlings; Sgt. W. S. Smith; P/O. P. A. Taverner; F/O. E. A. Thomas.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. W. Bentley; P/O. P. T. Beszant; P/O. N. A. Botting; Sgt. G. C. A. Bradshaw; Sgt. D. Bruce; Sgt. C. Burton; Sgt. S. F. Clarke; Sgt. C. Cobley; Sgt. A. S. Corlett; F/O. N. F. Crisp; Sgt. R. C. L. Cummins; Sgt. J. Fletcher; P/O. R. M. C. Frencham; Sgt. W. G. Gamage; Sgt. T. E. B. Graham; Sgt. M. E. Haffenden; Flt. Sgt. G. E. Hall; Sgt. J. Harding; Sgt. S. H. Hill; Act. Sqn. Ldr. I. McA. Huntley-Wood, D.F.C.; Sgt. I. G. Jones; W/O. J. W. Jones; Sqn. Ldr. C. R. Kelaher; F/O. K. J. Knight; Act. Group Capt. A. F. McKenna; F/O. P. W. Manning; Sgt. R. Maund; Sgt. K. Meredith; Sgt. C. Mollison; Sgt. R. A. Moodey; P/O. R. C. Ord; Sgt. G. Palmer; Sgt. C. R. Parish; Sgt. D. G. Rees; P/O. P. E. Rollins; F/O. M. G. Sheerman; Sgt. F. Stothard; Flt. Sgt. J. G. Stuart; Sgt. E. G. Truman; Flt. Sgt. A. J. C. Whitehead; Sgt. J. Wilson; F/O. J. L. Young, D.F.M.

WOUNDED OR INJURED IN ACTION.—Sgt. J. Barker; Sgt. J. R. Tummey.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. D. V. Blaikie; Sgt. J. H. Brown; Act. Wing Cdr. J. M. Bryan, D.F.C.; Sgt. E. R. Cocker; Flt. Sgt. J. D. McA. Duncan; Sgt. G. M. Ferguson; Flt. Lt. G. J. F. Jones; Flt. Sgt. R. Jones; Sgt. D. C. Kibble; Sgt. M. B. Pelham; F/O. C. R. Pollard; Sgt. D. D. Roberts; Sgt. T. E. Stubbs; Sgt. J. Thompson.

MISSING.—Flt. Sgt. C. F. Adams; Sgt. T. E. Alexander; Flt. Lt. W. F. Anderson; Sgt. R. Bartram; F/O. B. E. Bell; Flt. Sgt. M. Bemrose; Sgt. A. C. Benham; Sgt. G. W. Boswell; F/O. H. R. Briggs; W/O. F. C. Brittain; Sgt. D. H. G. Browett; Flt. Sgt. J. Brown; Sgt. T. A. Buckle; F/O. B. G. D. Bujac; Sgt. W. Burke; Flt. Sgt. D. Burton; Flt. Sgt. P. J. Butcher; Sgt. R. A. Castle-Hall; F/O. H. D. Clark; Sgt. H. G. Colwell; Sgt. R. Cotter; Sgt. T. L. Dawes; Act. Flt. Lt. W. E. Dawes; Flt. Sgt. F. G. Dean; Flt. Sgt. F. Devine; F/O. J. A. Downie; F/O. P. T. Driscoll; Sgt. W. Duncan; Flt. Sgt. H. Earl; Sgt. A. Y. Ferguson; Sgt. R. Fitchett; F/O. A. H. Ford; Sgt. A. B. Freemantle; Sgt. J. C. Gibson; Sgt. T. Gilmartin; P/O. J. Gilmour; F/O. L. F. Green; Flt. Lt. N. S. Green; Flt. Sgt. J. B. Greenwood; Flt. Sgt. G. F. Griffiths; Sgt. F. Haley; Flt. Sgt. A. H. Hammond; Sgt. F. R. Hardy; F/O. W. W. Heaton; F/O. P. D. Hemmens; Sgt. J. C. Higginbottom; Sgt. T. E. Hill; Flt. Sgt. L. A. Hinch; Sgt. J. Holden; Flt. Sgt. G. S. Holland; Sgt. S. C. Holmes; Flt. Sgt. R. T. Hood; Sgt. C. Hore; Sgt. N. Howarth; F/O. R. P. Howe; F/O. A. R. Hyde; Sgt. J. Jackson; Flt. Sgt. T. Jefferson; Sgt. J. S. Jenkins; W/O. J. A. Jenkinson; Sgt. D. W. Jennings; Flt. Lt. A. H. E. Kahn; Sgt. M. T. Kelly; Flt. Sgt. J. G. W. Kelso; Sgt. W. McC. Latimer; Sgt. J. A. Lauder; Sgt. D. J. Lawler; Flt. Sgt. D. W. Leverington; P/O. E. F. Lewis; Flt. Sgt. H. E. Lillicrap; W/O. F. Lofthouse; Sgt. C. Lowrie; Sgt. P. J. McCarthy; Flt. Sgt. A. McLeod; Sgt. J. McMinn; F/O. G. R. Manley-Tucker; Sgt. G. E. Martin; Sgt. K. E. Maynard; Flt. Sgt. F. A. Meeghan; Sgt. R. E. Miles; Sgt. R. S. Mobbs; Sgt. A. Moult; F/O. H. McW. Murray; F/O. G. H. Packham; Flt. Sgt. G. Palamountain; Sgt. J. G. P. Payne; Act. Wing Cdr. K. Petrie; Flt. Sgt. C. Philp; F/O. R. G. Picton; P/O. A. L. Puttock; Sgt. L. J. C. Rainbow; Sgt. J. J. Read; Flt. Lt. G. Richardson; P/O. V. G. Ross; F/O. S. E. Rotherham; Act. Sgt. N. W. Salmon; Sgt. D. A. Sanderson; Flt. Sgt. R. W. Sandover; Sgt. F. W. Savage; Flt. Sgt. G. D. Savage; L.A/C. E. J. Skeggs; P/O. P. G. Skuce; Sgt. J. G. R. Smale; P/O. T. S. Smiley; Sgt. A. Smith; P/O. L. J. R. Smith; Sgt. F. E. Spinks; Sgt. T. J. B. Stafford; Sgt. J. A. Surridge; Flt. Sgt. K. M. F. Swadling; Sgt. O. A. Teasdale; Sgt. F. G. Tomlinson; Flt. Sgt. J. M. Trend; Sgt. C. J. Trott; Sgt. G. J. Ware; Sgt. K. W. Warner; P/O. J. Watson; Sgt. J. M. Watts; Sgt. B. F. Webb; Sgt. D. L. Whamond; Sgt. E. White; F/O. R. J. White; Flt. Lt. S. E. Wodehouse; Flt. Sgt. G. H. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. L. Backhouse; L.A/C. S. R. F. Markwich.

KILLED ON ACTIVE SERVICE.—Sgt. E. Ankers; Cpl. A. Brookes; Sgt. E. Brown; Flt. Lt. J. K. De Roeck; Act. Sqn. Ldr. R. G. S. Grant; Sgt. R. F. Gray; Sgt. F. W. D. Hearn; Sgt. J. Key; Flt. Sgt. A. McKenzie; Sgt. I. McLachlan; P/O. J. W. Morton; Sgt. W. G. Paterson; Sgt. W. G. Spencer; F/O. J. Starr; A/C.2 G. B. Stone; Sgt. F. Taylor; Sgt. N. G. Wakefield.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. J. M. Aiken; L.A/C. A. G. Ephgrave; L.A/C. A. Smith; Sgt. F. D. Williams.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. C. Silcox; L.A/C. J. Maxfield.

DIED ON ACTIVE SERVICE.—Act. Cpl. T. H. Ainge; A/C.1 K. D. Bevan; A/C.2 P. A. Burton; L.A/C. D. D. Day; L.A/C. K. Naylor; Sqn. Ldr. H. C. Robinson; A/C.2 T. H. Vale.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. H. L. Parry; Flt. Lt. W. J. Taylor.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. J. M. Craig.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. E. Parker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. F. B. Allan; Sgt. D. E. Bennington; Act. Sgt. J. E. Challinor; P/O. J. S. K. Dalziel; P/O. F. D. Findlater; F/O. S. M. Forrester; Flt. Sgt. J. C. Gibney; P/O. L. J. Haymes; Flt. Sgt. A. H. Hill; W/O. F. H. Jones; P/O. F. O'Dwyer; Flt. Sgt. K. B. Phillips; Flt. Sgt. J. L. R. Stubbings; W/O. C. A. Walsh; W/O. J. G. H. Webster.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. T. R. B. Anderson; Flt. Sgt. H. C. Caswell; Flt. Sgt. W. A. Roach; Flt. Sgt. K. C. Walker; F/O. F. O. Williams.

MISSING.—P/O. H. W. Bird; P/O. H. S. Delacour; Flt. Sgt. A. Lord; F/O. J. C. Low; F/O. D. MacFadyen; F/O. S. W. Mackay; F/O. J. S. Nott; Flt. Sgt. I. D. Stuart; P/O. W. V. Thurston; Flt. Sgt. R. J. Warren.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. B. Marden; W/O. A. L. Terry.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Lt. F. J. Clark; W/O. L. F. Davey; Sgt. W. H. McGuigan; Flt. Sgt. D. B. Machum; F/O. R. W. Murray.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. F. McRae; Flt. Sgt. C. P. Pierce; F/O. A. Renton; Sgt. W. R. Roberts; Flt. Lt. G. Turner.

WOUNDED OR INJURED IN ACTION.—F/O. J. Muff; Sgt. W. I. Quigley.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Wing Cdr. L. V. Chadburn, D.S.O., D.F.C.

MISSING, BELIEVED KILLED IN ACTION.—F/O. A. Allan; F/O. A. C. Elliott; F/O. W. Jackson; W/O. R. McMillan; P/O. C. S. Thompson; Sgt. C. C. White; Sgt. D. M. Willmott.

MISSING.—Sgt. J. E. Byers; F/O. J. McV. Clement; Sgt. M. W. Couper; F/O. D. A. Davey; Sgt. D. I. Davies; F/O. A. De Breyne; P/O. J. R. Dryden; P/O. A. V. Everest; Sgt. R. W. Francis; Sgt. M. E. Gates; W/O. W. I. Girvin; F/O. J. A. Grinde; P/O. G. A. Henson; P/O. A. L. Johnston; P/O. G. C. Krahn; P/O. J. M. Lacombe; P/O. F. L. Ladd; F/O. G. K. Lancaster; P/O. D. I. A. Laurie; P/O. L. R. Lauzon; Flt. Sgt. R. G. Lemky; F/O. D. J. McMullen; F/O. C. R. McOrmond; Sqn. Ldr. I. McK. McRobie; Flt. Lt. V. K. Moody; P/O. A. C. Mynarski; F/O. S. A. Phillips; F/O. R. N. Pole; W/O. A. J. Ricci; F/O. J. S. Ritchie; P/O. G. E. Robertson; F/O. H. Sager; Flt. Lt. H. R. Smith; Flt. Lt. D. Wallace; P/O. S. F. Williams; F/O. R. N. Wilson; P/O. J. F. Wyllie.

KILLED ON ACTIVE SERVICE.—P/O. G. D. W. Buchanan; Sgt. W. C. Davis; Sgt. J. J. U. Stevens; L.A/C. P. Stichman; Sgt. R. J. Taylor; F/O. W. J. Windeler.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Act. Sqn. Ldr. F. K. Moynihan, D.F.C.

MISSING.—P/O. T. W. Dale; P/O. M. Lambert; Flt. Sgt. S. A. Rae; P/O. R. J. Whittleston.

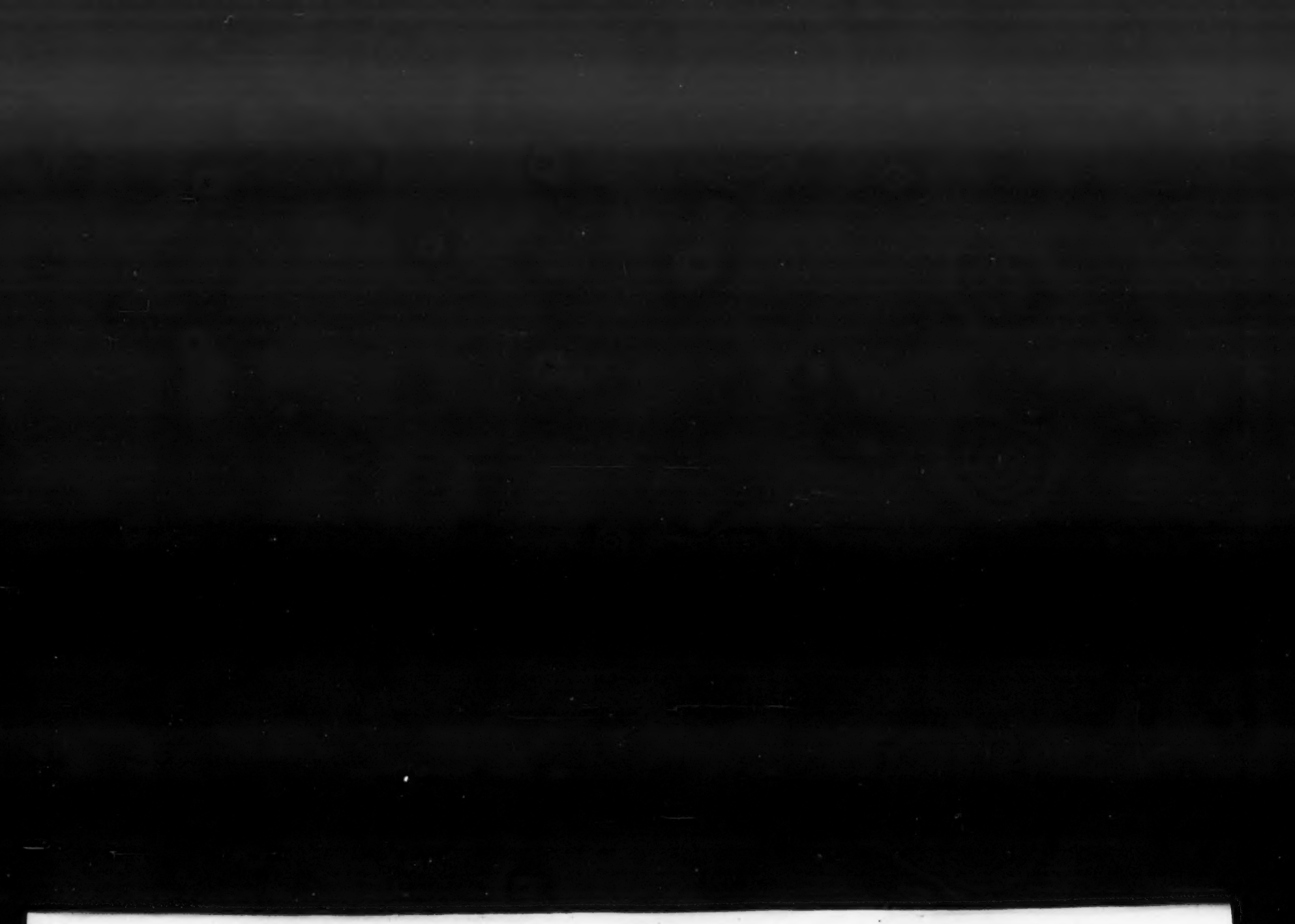
KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. B. Waring.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Lt. T. F. B. Collins.

MISSING.—Lt. J. Burt.

Official Corrections

Casualty Communiqué No. 426.

Under "MISSING" delete Sgt. P. F. Broadribb, Sgt. E. Healy, Sgt. G. J. King, Sgt. P. Murphy, P/O. L. Poole, Sgt. A. Russell, and Sgt. J. Westwood. R.A.A.F. under "MISSING" delete P/O. A. N. Durham.